GAS JOURNAL

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CO-PARTNERSHIP DEBATE

AN Opposition motion to annul the Gas (Co-Partnership) Regulations was moved in the House of Commons on May 3 by Mr. H. V. Raikes, M.P. for Wavertree, Liverpool. Mr. Raikes expressed the fear that the extension of co-partnership schemes from 1949 to 1951 was purely a bogus attempt on the part of the Government to pretend that they were trying for a period to safeguard co-partnership. He asked the Parliamentary Secretary of the Ministry of Fuel and Power to explain the reason for this extension. He also asked why new entrants to the gas industry were absolutely and deliberately debarred from coming in under the profit-sharing schemes. His opinion was that the refusal indicated that the Government were frightened to allow what might be described as an 'open shop' for new people to come into the co-partnership schemes in the hope that, having come into them, they would continue beyond the date of 1951. Secondly, he said that, contrary to the Government's guarantee that no one's position would be worse after nationalisation than it was before, there was a discrepancy between old entrants who would continue to draw their co-partnership bonus until 1951 and new entrants who would be unable under any conditions to receive a bonus. Thirdly, he asked the Minister whether the advantages of cheaper coal, cheaper gas, and, in certain cases, cheaper insurance rates, enjoyed under co-partnership, would continue in the next few years. Mr. J. A. Boyd-Carpenter, M.P. for Kingston-upon-Thames, seconding the motion, said that the Government appeared to be hesitant to make a frontal attack on co-partnership. It seemed, he said, that they had been affected by the openly hostile attitude towards co-partnership of certain of their supporters, but equally it seemed that they realised that co-partnership commanded great enthusiam in the country outside.

Colonel R. S. Clarke, M.P. for East Grinstead, made three criticisms of the Regulations. First, the system whereby the three years before vesting date would be averaged in computing the bonus payment was unfair, particularly to those companies, which through no fault of their own—mainly through war damage or the emigration of their consumers—had had a number of bad years. Secondly, he condemned the non-participation of new entrants. It was not only not being allowed to take part in the bonus payments which seemed to him unfair ; it was not being allowed to participate also in the many amenity schemes. Thirdly, he thought that the provisions relating to welfare were going to be very difficult to carry out. If that proved to be the case, he asked whether they would see an amending Bill brought in, as in the case of the coal industry, saying that what was in the original orders could not be carried out and had to be scrapped. Finally, Sir Patrick Hannon, M.P. for Moseley, Birmingham, asked: 'Is it the policy of the Government to destroy in the future any kind of co-partnership in industry with all the amenities it brings into industry? '

In reply, first to Sir Patrick Hannon, the Parliamentary Secretary to the Ministry of Fuel and Power, Mr. A. Robens, said that the Government was not going to impose co-partnership schemes or take any action in connection with them, but were going to leave the matter to the workers in the industry through their organisations and to those who had been appointed to managements. There was nothing in any co-partnership scheme, other than the distribution of profits, that could not be obtained in the ordinary way through a trade union agreement. There could be no question of the disposal or allocation of profits to the workers in the industry, and all that the order did was to provide a period during which both sides of the industry could get together and make new arrangements to replace the present co-partnership schemes. Broadly speaking, Mr. Robens said, the schemes did provide for the sharing of profits: that was impossible within the nationalised industry. Before the Regulations were laid before the House, they had consulted the trade unions, staff organisations, the Gas Engineers' National Guild, the Gas Co-partnership Nationalisation Committee, and the Gas Council, and there had been general agreement that two years was a reasonable time in which both sides could get together and formulate new ideas. If the area Boards and the organisations made their arrangements before the two years' new regulations would be brought in under the Act for winding up the schemes, and the industry would carry on with the new arrangements which would be arrived at voluntarily between both sides. During the two-year period the concessions of cheap gas, coke, and things of that description, would be continued. It might be well that in the new arrangements the organisations representing the staff and the area boards should include them in their agreements. On the question of new entrants, Mr. Robens said that there was no bar on new entrants to the scheme who were in the industry and had begun the qualifying period for entrants to the scheme. There was no point in bringing brand new entrants into a scheme which would be wound up within a comparatively short period of time.

In the debate which followed, Mr. R. Ewart, M.P. for Sunderland, said that the idea that the top level trade union officials had been opposing co-partnership schemes because of the frustrating influence on trade union organisation and development was nonsense. During the committee stage the people who enjoyed co-partnership benefits were found to be in consultation with the trade unions and their leaders, and had evolved a measure of the scheme which had been presented that evening to the House. They said it was inevitable that, in passing from private enterprise to national ownership, co-partnership could not continue any longer on its present basis. If co-partnership were to be the order of the

industry it would have to be an over-all co-partnership designed to cover the whole of the nationalised industry. The trade unions were in favour of bonus output payments and other incentive arrangements which were, in effect, payments by results. There had to be a unified policy of payment by results and bonus schemes. The present scheme, Mr. Ewart concluded, should continue for two years, and in the meantime, not Parliament but both sides of the industry, through collective bargaining, should determine future policy on the matter.

The House divided on the motion, which was lost by 59 votes to 197.

WHOLE HOUSE HEATING

AN article in our issue of April 6 described an important experiment being conducted at Stanmore by Radiation, Ltd., who have built and equipped two houses which introduce in practical form a new conception of whole-house heating coupled with the provision of an ample supply of hot water, the entire scheme conforming with rigid standards of fuel economy. The system employed is that of the controlled circulation of heated air. It is a very flexible system, automatic in operation, responding at once to the requirements of the individual user. It also gives a great measure of freedom to the architect in planning the house. We have inspected these houses and are impressed by the possibilities which this new conception opens up.

As we go to press we learn of further experiments to be carried out by the Department of Scientific and Industrial Research at Abbots Langley, where four more houses have been completed for an investigation of warm air heating in association with open planning. Again, this is whole-house heating, and the equipment installed is by Radiation, Ltd. The houses are extremely well protected from the weather. The insulation gives figures better than the Egerton standards, and double windows are installed throughout. To avoid draughts and excessive ventilation, all windows and external doors are weather-stripped. The houses are similar not only in design but in their heating systems, the object being to examine the degree of uniformity of performance that is attainable. The warm air is distributed by fan to all parts of the houses through systems of ducts designed so that the air can be fed in at a number of alternative points, some at high and some at low level. The houses were occupied this month, and we shall look forward to hearing of the reactions of the occupants to this new type of heating and to the findings of the Building Research Station of the D.S.I.R. Psychological as well as physiological factors can be assessed only as a result of the occupiers' reactions after living in the houses for a considerable period. We ourselves shall follow with keenest interest both the Stanmore and the Abbots Langley investigations.

THE GAS ACT, 1948

SHORTLY before vesting date Messrs. Butterworth and Co. (Publishers), Ltd., published in their Annotated Legislation Service a useful manual which has also been reprinted as a separate volume on *The Gas Act*, 1948 (21s., by post 10d. extra) by Mr. Leslie F. Stemp, B.A., LL.B., of the Middle Temple, Barrister-at-Law, Legal Officer of the Gas Council, and Mr. R. A. Wing, B.A., LL.B. The book should form a convenient work of reference, not only to existing officials anxious to become familiar with the new set-up of the industry, but also to local authorities and the gas-consuming public. Mr. Stemp points out in a preface that the Gas Act is the completion of the 'trilogy' of Acts by which the fuel industries of the country are transferred to public ownership. Each Act marks a development in the method of public control of industry, the effect of which is an increasing devolution of power from the centre. The Coal Industry Nationalisation Act, 1946, while establishing the National Coal Board, made little if any provision for local organisation. In 1947 the Electricity Act established Area Electricity Boards but such Boards were mainly distribution agents for electricity generated by the British Electricity Authority, whose control over the Boards was in most matters absolute. The tendency towards devolution is most clearly marked in the Gas Act, under which the Area Boards are not only the carbonising authorities but are virtually independent and autonomous bodies.

While, contrary to the recommendations of the Heyworth Report, a central Gas Council has been established on which each Area Board is represented by its Chairman, the functions of the Council are in the main advisory and financial. The Gas Act also differs from the Electricity Act in that it effects a repeal of virtually all public and private legislation formerly applicable to the gas industry and establishes a new code by which the industry will be governed. The new code is largely a re-enactment of former legislation, but many of the restrictions and anachronisms which have arisen in the past century, particularly in regard to price, are swept away, and the Area Boards now have greater elasticity in the promotion of two-part and block rate tariffs, which formerly have been the exception rather than the rule in the industry. Although gas companies were dissolved by the Act on May 1, the interests of their shareholders remain in many cases to be represented by Stockholders' Representatives. The compensatory provisions of the Act are of transitory interest, but they have been treated somewhat fully in the book in order to meet the requirements of those on whom will fall the important duty of representing the interests of the proprietors of the former gas companies. A concise summary of the development and structure of the gas industry before vesting date is included in the general introduction, in which special care has been taken to amplify with illustrations the somewhat complicated provisions of the Act relating to the valuation of gas securities.

CANADIAN TRADE FAIR

The timely opening of the Canadian International Trade Fair in Toronto on May 30, following so closely upon our own British Industries Fair, provides an opportunity for the continued display of British products in the world market. This event is to be welcomed all the more because of the increasing difficulties which attend the efforts of our exporting concerns to find wider markets for their goods. It may also be the first step towards remedying the deterioration in Anglo-Canadian relations, particularly in the economic and trade fields, which has caused considerable concern on both sides of the Atlantic in recent months. More than 1,400 exhibitors displayed the products of 28 countries at the 1948 Fair, and there is every indication that this year there will be an even wider representation of exhibitors. Exhibits will be grouped in 21 trade classifications of consumer and capital goods, and over three-quarters of a million sq. ft. of floor space are available for display. Toronto in June promises to be a world market place.

LEEDS UNIVERSITY

In October, 1946, 20 first-year students were admitted to the Fuel Department of Leeds University. There were no fewer than 95 applications for these 20 vacancies. Once again the demand for graduates far exceeded the supply. These facts are from the report of the Livesey Professor, Dr. A. L. Roberts, for the session 1946-47. It is a healthy sign, but the position cannot be met until extensions are made to the accommodation for teaching and practice. During the session the University were able to accept the offer by the British Coke Research Association to endow a research fellowship, thus further strengthening the long and close relations between the Department and the coking industry. Then came an offer from the Power-Gas Corporation, Ltd., to endow an entrance scholarship; and the Livesey Professor mentions in his report the indebtedness of the Fuel Department to this company for continued financial help towards equipment and maintenance. The Yorkshire Copper Works, Ltd., came forward with the endowment of a scholarship for research in one of the departments of the Faculties of Science or Technology. This practical relationship between industrialists and the University will, we are certain, be of mutual benefit—and not only this; it will contribute to the nation's intellectual and industrial strength.

WOMEN'S GAS COUNCIL

We were pleased to be present at the conference of the W.G.C. at Harrogate, though we must confess that the proceedings, well organised as they were, were somewhat prolonged; certainly there was ample time for talk and for 'getting together.' Harrogate, of course, is an attractive resort, and Mrs. W. M. Buchanan must have felt gratified at the results of her planning. The annual meeting, neatly sandwiched between a plethora of social events, was a highlight not only because the Minister of Fuel and Power, Mr. Hugh Gaitskell, was present, and addressed the gathering, but because the Chairman of the North Eastern Gas Board, Dr. Roger S. Edwards, gave the W.G.C. the assurance that the Board had no intention of cutting-off the former money grant. A report will be found on a later page of our issue to-day, and we would call particular attention to Mr. Gaitskell's remarks on competition. 'There must,' he said, 'be competition between alternative managements which provide, distribute, and sell the various fuels which consumers may use.' And he added: 'I believe that the charges which are made for these fuels, and which will certainly influence consumers in their choice, must be based upon costs. The competition between different forms of fuel should be fair competition, and we expect competition with other forms of fuel to continue.'

INSTITUTE OF FUEL

On a later page we give a report of the speeches at the annual luncheon of the Institute of Fuel, which, as usual, was a highly successful gathering. The Institute grows from strength to strength, the membership at March last being 3,467. The establishment of the Institute's new headquarters and the attainment of the Royal Charter constitute two of the greatest strides in the Institute's record; and there is no doubt that the Institute will continue to merit and attract the attention of a wide body of technologist, industrialists, Government departments, and, indeed, all who, interested in fuel, have the welfare of the nation as their first interest. It is now more than three years since the formal promulgation of the Education Scheme. From the first it was envisaged that as long as five years would be necessary as a testing period, and the principle has been followed of avoiding fundamental changes of the scheme within that period. The Education Committee has now started to consider desirable amendments of the framework which should become effective in 1950. At the meeting preceding the luncheon the Hon. Secretary, Mr. J. F. Rouca, in presenting the annual report, referred to the work of the District Sections of the Institute, which he characterised as 'the backbone of the Institute.' During the period covered by the report the *Journal* has followed these activities closely, and we have published exclusive articles based on the various meetings which appeared to us as likely specially to interest our readers.

Personal

Mr. G. W. PERKS has been appointed Engineer and Manager to the Stockton Unit of No. 6 Division of the Northern Gas Board and to act as Deputy to the Divisional General Manager in his absence. He was appointed Deputy Gas Engineer and Manager to the Stockton Corporation in 1938.

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The Directors of the Hartlepool Gas and Water Company have made a presentation to Mr. J. R. BRADSHAW, J.P., who has left the Board to become Deputy Chairman of the Northern Gas Board. The gift comprised an inscribed gold watch, and was handed over at a gathering of the Directors and staff by the Chairman, Mr. J. S. Appleby.

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Mr. ALEXANDER MCFADYEN, Engineer and Manager at Dumbarton, is taking over the management at Helensburgh in place of Mr. David Fulton. Mr. McFadyen joined the Dumbarton undertaking direct from school and passing through the various grades to his present position witnessed an expansion of the undertaking to four times the output in 1923. He will continue to manage the Dumbarton works with that at Helensburgh added to his duties.

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Mr. W. F. EDWARDS, F.C.I.S., formerly Manager and Secretary of the Bridgend Gas Company and now Convenor of the Mid-Glamorgan Group, has been appointed General Manager and Secretary of the Port Talbot and Bridgend undertakings, and Mr. W. D. REES, M.INST.GAS E., formerly Deputy Engineer and Manager of the Port Talbot Corporation Gas Department has been appointed Engineer of the Port Talbot and Bridgend undertakings.

Mr. W. JONES, C.B.E., part-time member of the Wales Gas Board and until recently Clerk of the Denbighshire County Council, has been appointed a member of the Royal Commission on Capital Punishment.

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Following the appointment announced last week, of Mr. F. L. Atkin, M.I.Mech.E, M.Inst.Gas E., as Chief Distributing Engineer of the West Midlands Gas Board, his previous post as Distributing Engineer of the Birmingham Gas Department has been filled by the appointment of Mr. R. W. NELSON B.SC., who becomes Distributing Engineer to the Birmingham District.

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Mr. E. O. ROSE, who was with the Tottenham and District Gas Company for 29 years, latterly as Deputy Engineer, has been appointed Tottenham Divisional Engineer under the Eastern Gas Board. Mr. S. A. KING, Gas Sales Manager of the Tottenham Company, with whom he served for 23 years, has been appointed Tottenham Divisional Sales and Service Manager.

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In view of the decision of the Minister of Fuel and Power to vest Associated Gas and Water Undertakings, in the South Eastern Gas Board, the Board has arranged to retain the services of Mr. W. H. BENNETT, Chairman and Managing Director of the Company, for a period after the vesting date. Mr. Bennett will continue to occupy the offices formerly used by the Company at Cherchefelle, 2, Chart Lane, Reigate, Surrey.

INSTITUTION OF GAS ENGINEERS

Programme of Annual Meeting, June, 1949

As already announced, the 86th Annual General Meeting of the Institution of Gas Engineers will be held at the Institution of Civil Engineers, Great George Street, London, S.W.1, on June 13 and 14, and will be followed immediately by the Conference of the International Gas Union, a summarised programme of which was published in the *Journal* of April 6 (p. 45). To enable both meetings to be completed within the week the Institution programme has been compressed into two days, and a number of features, particularly works visits, have been omitted These omissions do not represent any change of policy on the part of the Council but are designed to meet the special circumstances of this year. Following is the programme:

MONDAY, JUNE 13

3 p.m. Opening of Meeting. Welcome to Representatives from Overseas. Adoption of the 86th Annual Report and Accounts (*Communication No.* 348). Scrutineers' Reports of the Ballots. Presentation of Medals.

3.25 p.m. Presidential Address by E. Crowther, M.ENG., M.I.C.E., M.INST.GAS E., Chairman, Northern Gas Board. (*Communication No.* 349).

4 to 5 p.m. Presentation and Discussion of Paper on 'Peak Loan Problems in the United States,' by R. W. Hendee, President, American Gas Association (*Communication No.* 350).

TUESDAY, JUNE 14

10 a.m. Presentation of Address by A. E. Sylvester, F.C.A., Chairman, The Gas Council (*Communication No.* 351).

11 a.m. General Meeting of Contributors to the Benevolent Fund of the Institution of Gas Engineers.

11.15 a.m. to 12.15 p.m. Presentation and Discussion of Paper on 'A Background to some Economic Problems in the Gas Industry,' by D. G. Rose, B.SC. (ECON), Coke Manager, North Thames Gas Board (*Communication No.* 352).

12.45 p.m. for 1 p.m. President's Luncheon in the Lancaster Room of the Savoy Hotel, Victoria Embankment, W.C.2.

3.15 to 4.15 p.m. Presentation of a Symposium of Short Papers on a variety of subjects (*Communication No.* 353).

4.15 to 4.30 p.m. Concluding Business of Meeting.

8 p.m. to 12 midnight Reception and Dance in the Connaught Rooms, Great Queen Street, Kingsway, London, W.C.2.

Sagem Golfing Society will hold their Spring Meeting at the Denham Golf Club on May 25. Will any member who has not received notice, or any member of the S.A.G.E.M. who would like to join the Society, please communicate with L. Trewby, 65, Nightingale Road, Rickmansworth, Herts.

Members of the Southern Association of Gas Engineers and Managers (Eastern District) and their ladies will visit Portsmouth on May 31. The Hilsea gasworks will be open to inspection by courtesy of the Southern Gas Board, and arrangements have been made for the ladies to inspect H.M.S. 'Victory' in the Royal Dockyard.

Appointments

Eastern Gas Board

The following appointments have been announced by the Eastern Gas Board in addition to those already published in the *Journal*. Area Liaison Engineer: D. B. Parkinson, M.A., M.INST.GAS E. Assistant Accountants: P. F. Foster and L. C. Harcourt, A.S.A.A. Secretarial Assistant: F. J. Martin. Industrial Relations Officer: J. H. C. Bates. Secretary and Accountant (Ipswich Division): C. A. Spriggs, F.L.A.A. Accountant (Cambridge Division): J. L. Bayliffe, A.S.I.A.A., A.I.I.T. Secretary and Accountant (Norwich Division): R. A. Waller, A.C.A. Secretary and Accountant (Watford and St. Albans Division): E. T. Warren.

North Eastern Gas Board

The North Eastern Gas Board has issued the following schedule of groups and constituent undertakings:—

LEEDS (comprising Leeds, Yeadon and Guiseley, Calverley and Horsforth, Ilkley, and Otley). Group Manager: N. G. Appleyard, Market Hall, Leeds, 2. Leeds 27401-8.

BRADFORD (comprising Bradford, Keighley, Pudsey, Shipley, Bingley, Skipton, Kildwick, Silsden, Queensbury, Settle, Hellifield, and Hector Christie). Group Manager: C. A. Newham, Britannia House, Leeds Road, Bradford. Bradford 23031.

WAKEFIELD (comprising Wakefield, Castleford, Morley, Dewsbury, Royston and Brodsworth, Batley, Rothwell, Ossett, Knottingley, Pontefract, Normanton, Hemsworth, Featherstone, Garforth, Whitwood, Sherburn and South Milford, and Kippax Group. Manager: To be appointed (A. McDonald acting for time being). Temporarily at Bridge Street, Leeds, 2. Leeds 32571/4.

HUDDERSFIELD—HALIFAX (comprising Huddersfield (including Holmfirth, Honley and New Mill), Halifax, Spenborough, Brighouse, Sowerby Bridge, Elland, Todmorden, Mirfield, Hebden Bridge, Colne Valley, Kirkburton, &c., Meltham, Denby Dale, Skelmanthorpe, and Nortonthorpe). Group Manager: J. C. Tilley. Temporarily at Gas Offices, Ravensthorpe, Dewsbury. Dewsbury 287.

YORK—HARROGATE (comprising York, Harrogate, Scarborough, Whitby, Ripon, Malton, Filey, Pickering, Thirsk, Easingwold, Helmsley, Kirbymoorside, and Robin Hood's Bay). Group Manager: N. C. Sturrock, 48, James Street, Harrogate. Harrogate 3041-4.

HULL (comprising Hull (B.G.L.), Hull (East), Bridlington, Goole, Selby, Hessle, Beverley, Driffield, Hornsea, Pocklington, Brough, Withernsea, Rawcliffe and Snaith, Howden, and Market Weighton). Group Manager: A. L. Higham, Bankside Works, Sculcoates, Hull. Hull 34763.

GRID.—General. Communications to: L. W. Roberts, The Ryebread, Wheldon Road, Castleford. Castleford 2645.

North Western Gas Board

The North Western Gas Board announces the following appointments to its headquarters organisation:—

Deputy Chief Technical and Planning Officer: F. LITLER, B.SC.TECH., A.M.I.MECH.E., M.INST.GAS E., formerly Chief Engineer of United Kingdom Gas Corporation.

Construction and Maintenance Engineer: T. W. SIMPSON, M.INST.F., formerly Carbonising Engineer of United Kingdom Gas Corporation.

Distributing Engineer: W. H. B. PORTER, M.INST.GAS E., M.INST.F., formerly Distributing Engineer of United Kingdom Gas Corporation.

Production Engineer: T. NICKLIN, B.SC.(LOND.), M.INST.GAS E., A.M.I.CHEM.E., formerly Production Engineer of United Kingdom Gas Corporation.

Establishments Officer: J. H. ABELL, B.A.(ADMIN.), A.C.I.S., formerly Senior Administrative Officer, City of Manchester Gas Department.

The appointments made from the headquarters staff of the United Kingdom Gas Corporation follow the vesting of the assets and personnel of that Corporation, largest of the holding company groups, in the North Western Gas Board.

To Commemorate Employees who lost their lives in the last war a carved memorial plaque in the showrooms of the Rochester, Chatham, and Gillingham Gas Company, in High Street, Rochester, was unveiled recently by Mr. G. le B. Diamond, a Director of the Company, and dedicated by the Dean of Rochester (the Very Rev. T. Crick). The coats of arms in miniature, of Rochester, Chatham, and Gillingham, are affixed to the plaque. Relatives and friends of those whose names are commemorated on the plaque were invited to the ceremony, together with many members of the Company's staff. Among others attending were the Mayor and Mayoress of Rochester (Ald. and Mrs. A. C. Lyle), Mr. J. L. Percival (Town Clerk), the Mayor of Chatham (Ald. F. H. Lawrence), and the Mayor of Gillingham (Ald. P. J. Bruce). Tea was afterwards served in the Company's board room.

INSTITUTE OF FUEL

Many distinguished guests were entertained at the annual luncheon of the Institute of Fuel on April 28. The toast of their health was proposed by the President, Dr. D. T. A. Townend. They included Professor D. M. Newitt, M.C., F.R.S. (President, Institution of Chemical Engineers); the Presidents of other Institutions; Viscount Hyndley, G.B.E. (Chairman, National Coal Board); Lord Citrine, P.C., K.B.E. (Chairman, British Electricity Authority); Sir Henry Self, K.C.B., K.C.M.G., K.B.E. (Deputy Chairman of the B.E.A.); Sir Cyril Hurcomb, G.C.B., K.B.E. (Chairman, British Transport Commission); Sir Donald Fergusson, G.C.B. (Permanent Secretary, Ministry of Fuel and Power); Professor Sir Alfred Egerton, F.R.S. (Chairman of the Ministry of Fuel Scientific Advisory Committee); the Presidents of Research Associations, among them Viscount Falmouth (President, Gas Research Board), and Sir Charles Ellis, F.R.S. (President, B.C.U.R.A.); and Past Presidents of the Institute. The President extended a special welcome to Mr. G. G. Thurlow, the Student Medallist for 1948, and wished him success in his future career.

Two special guests who responded to the toast were Dr. H. Roxbee Cox (Chief Scientist, Ministry of Fuel and Power), and Dr. B. Mouat Jones, D.S.O. (sometime Vice-Chancellor, University of Leeds). The **President** paid tribute to the work of Dr. Roxbee Cox on aerodynamics, and particularly in connection with the development of the gas turbine, looked forward to close association with him in his new duties, and wished him every success. Dr. Mouat Jones was well known for his scientific interests. He had held appointments in several seats of learning, including the Government College of Lahore, and had served on many educational bodies and Government Commissions; he was no stranger to fuel technology, having served on the D.S.I.R. Sibley Committee which reported, during the war, on the inadequacy of the supply of fuel technologists.

Dr. **H. Roxbee Cox,** in his response, said he felt that in a sense he was sailing under false colours, for he was a Fellow of the Institute; but he took the opportunity to thank many in the Institute for the help they had given him in the past, among whom he mentioned particularly the late Dr. Lander and Dr. Townend. He was also very appreciative of the manner in which he had been received inside and outside the Ministry, by all who were interested in improving the production, distribution, and utilisation of our fuel and energy resources. There were, on the one hand, people who believed in the minimum of planning and the maximum of laissez-faire, and those at the other end of the spectrum who seemed to believe in planning coal, gas, electricity, and oil on a scale which was a little terrifying, and showed a tendency to plan all of us as well. He was among those who were neither on the right nor the left. In the technical field our primary duty was to gather more and more technical, scientific and economic data on the matters with which we were concerned. He did not think we could plan our thermodynamic Utopias; they had to evolve. It seemed to him that we must collect data on the things which in the past perhaps we had talked about a great deal but about which we had not done quite enough, and in that class he would put the gas turbine. He discussed its applications to marine propulsion, railways, &c., and in aircraft (in which latter it had already proved its worth), and said he did not think it had any future, apart from the aircraft field, unless it could consume crude fuel. In respect of land duties he did not think it had any future unless it could burn coal. So that one of the most urgent problems with which we had to deal was that of the gas turbine as a consumer of the fuel of which we had such a great quantity. He talked also of the underground gasification of coal, of finding out whether it was worth while trying to use in that way coal which could not readily be mined. He would like to see the total gasification of coal attacked on a broader front. That might provide a better way of using our home product in the gas turbine than the more obvious method of using pulverised coal. There was a long list of problems to deal with, and he detected the beginning of an intensification of effort. He felt sure that, as new information became available, it would be applied. He hoped, however, that there would not be an overgrowth of committees. In moderation they represented collaboration and co-operation and teamwork, but they could mean procrastination and frustration.

Dr. **B. Mouat Jones,** who also responded, made reference to the problem of staffing the universities. If they were to continue to train the first-class scientists and technologists which this country must have, he said, they must be able to attract and to keep first-class men on their staffs. Hitherto they had been able to do that, but nowadays the counter-attractions of industry and Government service had become so strong that the problem was really acute.

At a Meeting of the Cornish Gas Association, held at Truro on April 13, Mr. T. J. Greenwood (Bodmin) was re-elected President for the ensuing year. Mr. Greenwood has held this office continuously since 1944. Mr. D. Medlin (Penryn) was appointed Hon. Secretary and Treasurer in place of Mr. J. H. Newton, who has held the office since 1940.

CHANGE-OVER CELEBRATIONS

THE change over from Company and municipal to area Board ownership of the gas industry on May 1 was accomplished with the utmost smoothness. In the last few days before nationalisation became an accomplished fact there were many functions at which Directors, members of municipal gas committees, officials, and staff, bade farewell to the past and good luck to the future. Below we give a summary of the reports of such functions which have so far reached us.

Stockport

Following the final meeting of the Gas Committee, the Stockport Gas Department, now vested in the North Western Gas Board, held a farewell dinner, when the toast of 'The Gas Industry,' given by Councillor Sidney J. Hall, Chairman of the Committee, was responded to by Colonel W. M. Carr, Chairman of the Board. In addition to Colonel Carr, Mr. Arthur Henshall, Deputy Chairman of the Board, and Mr. H. Butters, member, were also present. Presentation by the Committee of personal gifts to the Gas Engineer and Manager, Mr. T. Reynolds, and to the Secretary, Mr. H. Russell, constituted a happy feature of the occasion. To mark the change in ownership the Department published a handsome brochure recording the history of the Undertaking.

Harwich

On April 23 the Harwich Gas and Coke Company gave a dinner and concert entertainment to all employees and their wives, to mark the change from private enterprise to public ownership of the undertaking. Supported by the Directors, the Chairman of the Company, Alderman T H. F. Bernard, M.B.E., J.P., presided over a gathering of about 70. Proposing the toast of 'The Gas Industry,' the Chairman wished the undertaking every success and thanked the employees for their loyal service. He had no doubt that the Harwich undertaking would play its part worthily under the new régimé, and under the guidance of the Company's Managing Director, Mr. W. J. Collins Garrard, all possible assistance would be given. The Chairman congratulated Mr. Garrard on his appointment as General Manager of the Ipswich Division of the Eastern Gas Board.

Burnley

The unveiling of a plaque to commemorate the inception of an extension scheme at the Oswald Street works of the Burnley Gas Department on April 29 was the occasion of a farewell civic function. The Mayor, Alderman W. Buchanan, members of the Council, and officials were present at the ceremony. The Mayor reviewed the progress of the Department, which he congratulated for its intelligent and progressive administration of the undertaking. Unveiling the plaque, Councillor W. Smith, J.P., Chairman of the Gas Committee, said he thought the Gas Committee had reason to be proud of the fact that they were responsible for starting the extension scheme. If the new unit of the works was anything like the old, the public of Burnley would have nothing to fear concerning gas output in the future. The civic party, which included Mr. W. A. Burke, M.P. for Burnley, made a tour of inspection of the works, and were afterwards entertained to tea at the Town Hall.

Kirkcaldy

Kirkcaldy Gas Department held a valedictory dinner on April 20, at which Councillor Peter Smith presided. A number of speakers envisaged the benefits that the industry would have under nationalisation. Villages at present without this service would be included in the national network and towns would find in time that plentiful supplies of this commodity would be available to aid development. Principal guest of the evening was Mr. Tom Hubbard, M.P., who said he was very happy to see with them that night Mr. James Dow, their former Gas Manager. He also complimented their present Engineer and Manager, Mr. D. L. Dickson, on his appointment as Divisional Manager under the Scottish Gas Board and wished him well in his new important post. Provost James Young said that throughout the history of the gas undertaking one of the characteristics had been the friendly relationship between management and workers. Looking forward to the new take-over, he saw no reason why that should not continue and why under the new set-up there should not be the same advantages and the same friendliness.

In the course of his remarks Mr. Dickson said that Kirkcaldy had made provision to extend its existing undertaking to cope in full with the amount of gas required within the next few years. Output from existing plant would be increased by 100% compared with 1939. They had gone further. They had realised that the gas industry was no longer a small local unit but something broader and they had got a new gasworks site. Mr. James Dow, Engineer and Manager, Paisley Gas Department, also spoke.

Colne

Colne Corporation bade farewell to employees of the Gas Department at a civic function on April 26. Alderman G. E. Wilmore, Chairman of the Gas Committee, said that the undertaking was established as a private company in 1838 and was taken over by the Corporation in 1877. Since that time, he said, £100,000 had gone to the relief of the rates, and the price of gas had not been increased since 1940, although coal had risen in price from 27s. to over 60s. per ton. The main factor contributing to the satisfactory position had been the co-operation between the Gas Committee and the staff of the Department. He referred to the work of Mr. A. H. Nicholson, Engineer and Manager, who had been the youngest corporation gas engineer in the country when he was appointed.

Mr. H. Butters, full time Member of the North Western Gas Board, said: 'We have every intention of running the North Western region on strictly commercial lines, and hope to avoid all red tape. The Board will decentralise management to the utmost, and we shall not attempt to interfere with management.' He hoped the Gas Committee would not look upon the transferring of the undertaking as the ending of their connection with the industry. The Board would encourage former Committee members to continue in an advisory capacity if they cared to do so.

Rotherham

On April 28, Rotherham Corporation celebrated the passing of their gas undertaking from civic to national ownership when members of the local Council and the Gas Department, members of the East Midlands Gas Board, and representatives of industrial consumers attended a farewell dinner at Rotherham Assembly Rooms. The occasion was distinguished by informal evidence of the friendly relationship that already exists between local and national personnel. Mr. H. F. H. Jones, M.B.E., J.P., Chairman of the East Midlands Gas Board, referred to the necessity for compromise between small and large units of administration. He said: 'We shall try to avoid the pitfalls of very large undertakings. It is easy to lose touch, and we shall try to strike a happy medium between 'big business' and local contacts.' Outlining the three points of his general policy, Mr. Jones said he aimed to give a square deal to the customer, 'because, after all, we depend on him for our livelihood,' and to gas personnel, and to meet his obligations to the State.

Mr. Henry F. H. Jones, Chairman of the East Midlands Gas Board, on the extreme right, with the Mayor of Rotherham (Mr. C. Bosworth) on the extreme left, the Mayoress, and Councillor F. Duke, Chairman of the Gas Committee, centre, at the handing over of the Rotherham Gas Department.

Southwold

At the conclusion of the final monthly meeting of the Directors of Southwold Gas Light Company, on April 26, the Chairman, Alderman Andrew J. Critten, J.P., spoke of the happy relationship which had existed among the Board and its staff. He said that the Company, formed in May, 1848, had endeavoured in its long history to give of its best to the public which it served. He had been the Company's Chairman for 28 years and it was satisfactory to feel that the Government would take over a flourishing and virile business. He expressed the great debt the Company owed to Mr. George Crick, who, going to Southwold in 1906, when the make of gas was 4 mill. cu.ft. per annum, had retired from his more active duties as Engineer and Manager last autumn with the make of gas at over 38 mill. He recalled not only Mr. Crick's skill and knowledge of his job, but his energy and foresight which for over 42 years had been of immense value to the Company. He concluded by asking Mr. Crick to accept from his co-Directors the personal gift of a

fountain pen, and from the Company a cheque, in appreciation of all that he had done so successfully in the interests of his firm. Mr. Crick, who had previously been presented with a fishing reel subscribed for by all the members of the staff, returned thanks in a brief speech.

Sittingbourne and Milton

A farewell tour of inspection on April 27 marked the occasion of the transfer of the Sittingbourne and Milton Gas Department to the South Eastern Gas Board. Between 70 and 80 guests, including Mr. A. Dalgleish, part-time Member of the South Eastern Gas Board, and Mr. P. L. Wells, M.P. for Faversham, were conducted round the Milton gasworks by Mr. G. V. Heeley, Engineer and Manager, and members of his staff. Councillor T. Buggs, Chairman of the Gasworks Committee, in reviewing the progress of the undertaking over 100 years, said that the gas output had risen from 20 mill. cu.ft. in 1912 to 90 mill. cu. ft. in 1948. He paid tribute to the work of Mr. Heeley and the members of his staff, and to the Council for their support. In reply on behalf of the employees, Mr. Heeley said that they had always had a progressive Council and he had always been blessed with a good staff and loyal workmen. Mr. Dalgleish revealed that only five local authorities in the area covered by the Board had their own gasworks. He hoped the Board was not going to forget that it was taking over long traditions of service to the community, and that if humanly possible it would try to improve on those traditions

Worcester

At a farewell dinner on April 29, Mr. John Stallard, who is 92 years of age, and who has been connected with the Company as solicitor for 66 years, and Chairman of the Board of Directors for the past 15 years, replied to the toast of 'The Worcester New Gas Light Company.' He referred to the development of the Company during the past 103 years, and paid tribute to Mr. Geo. P. Mitchell, the retiring Managing Director, who, during the past 16 years had completely reorganised the Company and rebuilt the works. To mark Mr. Mitchell's retirement, Mr. C. Millinchip, an employee for 57 years, presented to him on behalf of the employees a solid silver coffee set and tray. In replying Mr. Mitchell thanked those present for their co-operation, which had made possible the progress referred to by the Chairman. He hoped the same spirit of co-operation would continue under State ownership.

FAIR COMPETITION MUST CONTINUE

MR. GAITSKELL ADDRESSES WOMEN'S GAS COUNCIL

OVER 400 members of the Women's Gas Council attended the 'Home and Citizenship' Conference, held at the Hydro, Harrogate, on April 26-29. The members were given a civic welcome by the Deputy Mayor, Councillor A. V. Milton, on April 27, and this was followed by the inaugural address by the Dowager Lady Nunburnholme, President of the Council.

The Fourteenth Annual General Meeting of the Council took place on April 28 with Lady Nunburnholme in the Chair. Before submitting the annual report, the Secretary, Mrs. W. M. Buchanan, read a letter from Mr. A. E. Sylvester, Chairman of the Gas Council, who unfortunately was unable to attend the Conference. In the letter Mr. Sylvester expressed his great disappointment at not being able to be present at the Conference, and extended his best wishes for what he was sure would be a very successful affair. Within a few days, continued Mr. Sylvester, the shape of the industry would be changed out of all recognition because a thousand separate undertakings would be grouped into 12 areas administered by Gas Boards. But it would be wrong to exaggerate the effect of such a change in local affairs, for it was obvious that the work of the gas industry must go on, and the relations between the consumer and representatives of the industry were not likely to be changed at all. It would remain true that the main business of the gas industry was to supply gas to the domestic consumer and this meant principally the supply of gas for cooking. The gas industry must do everything possible to make her work easier and more pleasant, and it could only do this if women, through associations such as the W.G.C., knew their wishes and preferences. There would be a new outlet for women in the gas industry of the future, for he hoped it would be found that a considerable number of places on the Consultative Councils that were to be set up by the Minister of Fuel and Power would be filled by women.

Lady Nunburnholme, addressing the members, said that it was a momentous meeting; they had come to the end of private enterprise in the gas industry. Her own happy years as President would come to an end with that meeting. Lady Nunburnholme then expressed thanks to the Mayor of Harrogate for the civic reception the previous evening, and also to Mrs. F. W. Allum, President, Harrogate Women's Gas Development Association, for the arrangements which had been made for their hospitality. The Fourteenth Annual Report of the Council was read by Mrs. W. M. Buchanan, who summarised the wide activities of the Council during the past year.

Lady Nunburnholme then paid tribute to Miss K. M. Halpin, O.B.E., and intimated to members that she would succeed her as President. This was received with acclamation. After the formal business of the meeting was completed, the Mayor of Harrogate, Councillor C. Jack Simpson, said he was delighted to welcome the Conference to Harrogate. He particularly welcomed the Minister of Fuel and Power, Mr. Hugh Gaitskell.

Mr. Gaitskell then briefly outlined the new set-up of the gas industry under nationalisation. The 12 Gas Boards had been in existence for some time and it was intended to set up a Consultative Council in each area, the chairman of which would also be a member of the Gas Board. As the Consultative Council was a consumers' body, more than half the members would be nominated from local authorities. It was also hoped that a large number of women would be on these Consultative Councils.

Referring to the future of the Women's Gas Council, Mr. Gaitskell said the Act gave him only limited power and he was not really responsible for what happened to the organisation. He thought that such voluntary organisations had done a first-class job during the period of fuel economy; there was a great educational job to be done and he hoped they would continue. Now the emphasis ought to switch over from fuel economy to fuel efficiency, and he hoped they would participate in what they had done in connection with the economy campaigns.

Mr. Gaitskell made these three declarations:

'I believe most firmly that consumers should have freedom in their choice of fuel based on proper knowledge of what they are choosing between.

'There must be competition between alternative managements which provide, distribute, and sell the various fuels which consumers may use.

'I also believe that the charges which are to be made for these fuels, and which will certainly influence consumers in their choice, must be based upon costs. The competition between different forms of fuel should be fair competition, and,' the Minister added, 'we expect competition with other forms of fuel to continue.'

At the 14th Anniversary Dinner of the Women's Gas Council. Left to right: Dr. Roger Edwards, Chairman of the North Eastern Gas Board; Miss Kathleen Halpin, O.B.E., Chairman of the Women's Gas Council; Mr. Hugh Gaitskell, Minister of Fuel and Power; Dowager Lady Nunburnholme, President of the Women's Gas Council; Sir Paul Dukes, K.B.E.; and Miss Ellington Wright, Vice-Chairman of the British Gas Council.

There was, continued Mr. Gaitskell, an urgent need for co-operation in the carbonisation of coal between coke ovens and gasworks; a committee of the N.C.B. and the gas industry under Mr. Sylvester would be going into this matter. Referring to coke, Mr. Gaitskell said that consumers needed a great deal of help with regard to this fuel and he hoped that members would continue with their admirable work.

Dr. Roger S. Edwards, Chairman, North Eastern Gas Board, said he was pleased to be able to tell them that they were not cutting off their money grant; it had been decided that it should continue for this year, at least. The Gas Council had not yet had time to make any further decisions, but they wanted the W.G.C. to continue as they were doing for the moment.

BRITISH INDUSTRIES FAIR

NOTEWORTHY GAS DISPLAYS

HELD annually for 11 days the British Industries Fair is justly termed 'Britain's Shop Window.' The total number of overseas visitors last year was 15,000, representing 100 countries, but this year the Fair's attraction to these valuable customers is likely to be greater than ever. As usual there are sections at Olympia, Earls Court, and Castle Bromwich, the latter being devoted to engineering and hardware. This year the Birmingham section celebrates its twenty-third birthday by having 1,161 exhibitors, occupying about 413,000 sq. ft.—a considerable increase on the 1948 figures. The four main groups of exhibits for this section are: A, hardware, ironmongery, and brassfoundry; B, building and heating; C, electrical equipment; and D, engineering, metals, transport, and gas. In addition, the outdoor section provides examples of mining gear, agricultural equipment, and many types of structural products. The overseas guest is provided with every possible facility and there are 14 interpreters at Birmingham alone. Special air services between London and Birmingham are available, and there is another service operating between Castle Bromwich and Cardiff. Catering facilities are improved and it is likely that the total of 400,000 meals served last year will be surpassed.

It is pleasing to note that the availability of goods is much improved, while in some cases prices are considerably lower. The Fair, which opened on May 2, closes on May 13. For the benefit of late visitors and for the interest of readers unable to attend, the following notes have been compiled. The references to individual exhibitors are, we regret, extremely brief, but it is felt that they give some indication of the versatility of the exhibition and the individual quality of the manufacturers represented.

As in years past the British Gas Council stand bears the considerable responsibility of representing the gas industry's service to industry, a task for which it is necessary to have a stand of highly distinctive design in keeping with the magnitude of its purpose. In this respect the B.G.C. exhibit this year is somewhat disappointing and is dwarfed by the stands of many individual manufacturers. However, the equipment selected for inclusion on the stand is well-chosen and clearly indicates the flexibility of gas as a fuel for industry. Realising that the Fair is largely an exporters' exhibition, the B.G.C. have given special prominence to demonstrations and exhibits of the appliances best calculated to assist manufacturers in producing articles for export cheaply and speedily. The appliances shown are as follows:

Manipulative glass working under gas heat is demonstrated by personnel of James A. Jobling, Ltd., of Sunderland, who specialise in the production of chemical and scientific heat-resisting glassware. The demonstration shows the method by which such articles as condensers for estimating the alcohol content of spirits are produced within the close dimensional tolerances necessary in such cases.

This exhibit also includes the use of a gas-fired forced circulation hot-air furnace and is used to anneal the finished articles prior to their final inspection. By working on a previously determined time and temperature cycle for heating, soaking and cooling, it has the effect of eliminating any strains which may have been set up during the processing operations.

The type of experimental work which is continually being carried out by the gas industry to meet the requirements of manufacturers is typified in a demonstration staged by the Birmingham Gas Department in conjunction with a leading firm of tube makers.

In certain circumstances, manufacturers find it advantageous to heat bars, tubes or strips in the production line, thereby avoiding the necessity of batch loading into large furnaces. The method demonstrated enables the tubes to be heated while in motion, by employing a very small gas-fired furnace which is capable of temperatures in excess even of the 1,500°C. at which it will be operating during the demonstration. The temperature to which the tubes are heated is lower than the wall temperature of the furnace, and is varied according to the type of tube by adjusting the speed at which they are conveyed through the hot zone.

The furnace is fitted with an automatic control for mixing the gas and air, using gas at normal town pressure and air at 1 lb. per sq. in. The method shown can be applied also to bar-heating and other forms of manufacture.

A new development, demonstrated by the South Metropolitan Gas Company is the use of gas for immersion heating. For demonstration purposes, it is staged in a glass tank in order to show the internal heating tube. For industrial use the outer tube would be of metal or alloy, suitable to the existing conditions. Gas and air for combustion are drawn in by fan suction, the flue products being positively discharged to the atmosphere. The heater shown is rated at 0.5 therm (100 cu.ft.) per hour of town gas. Efficiencies of heat transfer to aqueous liquids of 80% upwards are easily maintained. For larger heating requirements, the heaters may be arranged in parallel with each discharging into a common exhaust duct. This method is being developed for water heating for industrial purposes and is now being used in the melting of soft metals.

Among the appliances shown for the first time is a mobile gas infra-red drying unit designed by Bratt Colbran, Ltd., for the rapid and economic drying of paint finishes.

This unit can dry a patch of paint on the body of a motor vehicle in a matter of minutes. Its construction includes a tubular column 6 ft. 3 in. in height, mounted on wheels. The gas-fired heating panel is elevated on the column and can be operated at any height up to 6 ft. and at any angle up to 45° upwards or downwards from the vertical position. A special hood is fitted over the panel to prevent the heat from being applied to the paint surface at too short a range.

There are, in addition, various other types of equipment. These include a gas-fired lead melting furnace manufactured by John F. Askam, Ltd., a gas-fired double-cased japanning oven with controls by F. J. Ballard & Co., Ltd., a gas-fired steam boiler with controls by Cochran & Co. (Annan), Ltd., a G.L.C. gas-fired assay furnace, a gas-heated 'Cyclone' generator for air heating by Plastic Spray, Ltd., an oxy-coal-gas profiling machine by Hancock & Co. (Engineers), Ltd., a gas-fired oven furnace by the Incandescent Heat Co., Ltd., temperature indicating equipment by Metalectric Furnaces, Ltd., a gas-fired forge furnace by Thermic Equipment & Engineering Co., Ltd., and temperature indicating equipment by Ether, Ltd.

TRADE STANDS

Stand D235.—**A.C.E. Machinery, Ltd.,** exhibit an interesting selection from their wide range of products. Chief among these are two types of hoist, one a swivelling hopper hoist of the type supplied to the food industry, and the other a dual carriage hoist for handling drums, cases, or sacks; both models are electrically-operated and are of the push button type. Also shown is a 5 cwt. capacity general purpose portable winch and a vibratory screen of similar construction to the well-known A.C.E. coke debreezing screens.

Stand A415.—The versatile wringer manufactured by **Acme Wringers, Ltd.,** is well demonstrated on the firm's stand. Its ability to fit on tub, sink, bath, stand, table, and washing machine and its various other advantages are effectively brought out, and the attractive design of the stand combines to produce an exceptional exhibit.

Stand D302.—The **Aerograph Co., Ltd.,** exhibit the range of Aerograph-Devilbiss spray guns for every painting purpose. Type MBC is particularly designed for motor car and furniture manufacture; type TCL for pressure and suction feed requirements in most industries and the decorative field, and types CA and MPS for a host of medium sized jobs. The MP and FP models are for fine work such as stencilling and there is also an air brush for art work. Pressure feed tanks, paint circulating systems, air transformers, spray booths and exhaust fans are also shown.

Stand D505.—**William Allday & Co., Ltd.,** on a very effective stand, exhibit a wide range of products including the following: Fans of various pressures; portable forges and all blacksmiths' hearths, tools, and equipment; furnaces for all duties, and a selection of tinsmiths' equipment.

Stand C213.—**C. R. Averill, Ltd.,** display their numerous types of paint to good effect. Among the many types manufactured by this firm are silica-graphite paints for iron and steelwork protection, Avarc synthetic finishes for industrial and decorative uses, lubricating graphite specialities, greases, jointing compounds, &c.

Stand C738.—**Bolton Metal Products, Ltd.,** display an interesting range of gas-heated washing machines, wash boilers and coppers for domestic use, manufactured in various patterns with vitreous enamelled or galvanised finishes.

Stand D611 and 510.—Red and black lettering on a cream stand has become a familiar feature of the various displays of **E. Boydell & Co., Ltd.,** and this B.I.F. stand is no exception. The range of Muir-Hill dumpers consists of three models with capacities from 3-6½ cu.yd., all being equipped with instantaneous gravity tip and two-way drive. A more recent production is a loader with numerous advantages including the 6-point suspension in which the front axle is fixed to the frame.

Stand C504.—**Bratt Colbran, Ltd.,** display their wide range of fires of all types, with many delightful fireplaces and settings in various materials. The exhibits are predominantly electric, but gas appliances are included.

Stand C419.—Specialists in burners, **Geo. Bray & Co., Ltd.,** clearly show the variety of their products on a pleasing and effective stand. Included are flat flame and cylindrical jet burners for domestic and industrial gas appliances, domestic incandescent and street lighting burners consuming coal gas and bottled gases, and also acetylene lamp burners.

Stand C703.—Certain of considerable attention is the interesting stand of **Bristol's Instrument Co., Ltd.,** on which a large selection of recording controlling, and indicating instruments for the measurement and control of temperature, pressure, flow humidity and operation in industry.

Stand D723.—Believing perhaps that there is safety in numbers, **British Ermeto Corporation, Ltd.,** provide on their stand an exhibit of no less than one thousand different Ermeto high pressure pipe couplings. Also shown is a vibration generator and high pressure pump, capable of testing couplings to 20,000 p.s.i.

Stand B214.—**British Fittings Co. (Hendon), Ltd.,** show a very wide variety of malleable iron tube fittings for gas, water, steam, oil and air steel tube fittings. There are also triple seal joints for plain end steel tubes.

Stand C217.—**British, Foreign & Colonial Automatic Light Controlling Co., Ltd.** are, of course, specialists in time controls of various types and their stand typifies their range of products. Included in the exhibit are electric time switches, counters, process timers, clockwork switches, time lags, refrigerator control switches, automatic switches for public lighting signs, window lighting, poultry switches, and electric and gas controls.

Stand D526.—A colour scheme of red, cream and apple green provides a cheerful background for the selection of equipment displayed by **British Jeffrey-Diamond, Ltd.** This includes a breaker, crusher, pulveriser hasher, and Atomill grinder for reducing a wide variety of friable and fibrous materials to products between 8 in. and 300 mesh.

Stands C511 and 410.—The largest single piece of electrical equipment ever shown at the B.I.F. takes pride of place on the stand of **The British Thomson-Houston Co., Ltd.** It is a 275,000 volt oil break circuit-breaker over 23 ft. high and weighing ten tons. Also shown is a model of a 1,200 h.p. gas turbine-alternator for marine propulsion, a multi-stage air compressor designed for 20,000 cu.ft. per min., 100 lb. per sq. in. discharge pressure, high voltage switchgear, rectifiers, control equipment, geared-motor units, thrustors, electronic equipment and various other products.

Stands D203 and 102.—Large scale vacuum equipment is the speciality of **The British Vacuum Cleaner & Engineering Co., Ltd.** and their stand displayed various of their products, including B.V.C. industrial portable vacuum cleaners, central installations, flue dust removal plant, sack cleaning plant and pneumatic conveying.

Stands D405 and 304.—**Brockhouse Heater Co., Ltd.** exhibit their well-known range of gas-fired steam and hot water boilers, the new Watts automatic gravity-feed domestic boiler, and the Selfstoke automatic gravity-feed boiler, as well as various other types of equipment.

Stand D622.—Tools for the gasfitter, plumber, and electrician appear in number on the pleasing stand of **Tom Carrington & Co., Ltd.**—Taps, dies, diestocks, tap-wrenches, ground thread taps, pipe cutters are but a few of them.

Stand A613.—**Colour Sprays, Ltd.** exhibit a very comprehensive range of spraying equipment and air compressor plants, most intriguing of which is a spray pen no larger than a fountain pen. Spray finishing in the gas industry and other industrial requirements are met by various larger instruments, and an interesting portable type inflation set weighing only 95 lb.

Stand D230.—An elaborate basketwork design constructed of copper contributes to the attractive and ingenious stand of the **Copper Development Association.** A model house in perspex indicates the many uses of copper for gas and water services, including the one-pipe sanitation system, while examples are shown of copper as it is used in many industries.

Stand B524.—**Cuxson, Gerrard & Co., Ltd.** display a wide range of First Aid equipment, including ambulance room apparatus, dressings, respirators, &c.

Stand D519.—Rubber goods for industry in wide variety are displayed by the General Rubber Goods Division of the **Dunlop Rubber Co., Ltd.,** and include conveyor and transmission belting, V-belts, hose, tubing, rubber covered rollers, ebonite, flooring, and many other products.

Stand D503.—**Elliott Brothers (London), Ltd.** represent their wide range of indicating and recording instruments by the inclusion on their stand of five panels of flush-type equipment. These show the new potentiometer recorder with magnetic inverter, flowmeters, relative humidity and temperature indicators, and similar devices. A range of pyrometers is displayed, and a demonstration given of remote indication and control.

Stands B501 and 400.—**The Eagle Range & Grate Co., Ltd.** exhibit a number of solid fuel burning appliances including the gas-ignited Fulham and Sutton convector grates, combination grates, freestanding and built-in slow combustion stoves, and large scale cooking.

Stand C700.—Temperature measurement and control instruments are also the speciality of **Ether, Ltd.**. Those shown on their stand include the 'Capacitrol' and 'Multronic' indicating controllers for gas, oil, and electrical apparatus, the Ether-Wheelco 'Flame-otrol' combustion safeguard, several forms of the 'indicorder' continuous chart recording instrument, and a complete range of solenoid operated valves. The measurement of molten metals and of high temperatures is dealt with by several interesting instruments.

Stand C736.—**Electrolux, Ltd.** display their usual range of gas-, electricity- or kerosene-operated refrigerators which make a particular appeal to overseas markets not only because of their hygienic properties but because they have been proved effective and efficient under all climatic conditions.

Stands D513 and 410.—The **Ewart Chainbelt Co., Ltd.** exhibit their range of products including Ewart's chains in Ley's famous 'Black Heart' malleable iron, chain sprockets, elevator buckets, complete conveying plants for all industries.

Stand C617.—**The Expanded Metal Co., Ltd.,** on an attractive stand, exhibit unbreakable incorrodible resistors for industrial and traction duty, electric heater units for convectors and air heating apparatus, industrial electric space heaters, expanded metal reinforcement for concrete and plaster, and expanded aluminium.

Stand B200.—An unusual group of exhibits grace the **Fibreglass, Ltd.** stand. These include white wool for thermal insulation and sound absorption, sewn sheets, rigid sections, wired mattresses for heat insulation; glass yarns, tapes, and sleeving for all electrical insulation, and numerous products of a similar nature.

Stand B324.—Enamels of many types are to be found on the stand of **Gittings & Hills Ltd.** Various articles are exhibited coated with industrial finishes such as 'Rackhard' synthetic stoving enamels, 'Lustreloid' cellulose lacquers, 'Githilac' oil resisting machinery enamels, synthetic and oil air drying and stoving enamels, and high temperature blacks.

Stand B329.—A large variety of perforated metals is exhibited by **G. A. Harvey & Co. (London), Ltd.** The complete range of 'Harco Rotarprest' ends, &c., includes a display of cold, rolled rings, flush butt welded, of exceptional size. Sheet metalwork is included in the display and a fine selection of office furniture and industrial equipment.

Stand C327.—**G. L. Howarth & Co., Ltd.** have an excellent stand showing their range of domestic hand-operated, gas-heated washing machines. Also displayed is the Howarth R5 gas-heated washing copper which attracted considerable attention at the recent Ideal Home Exhibition.

Stands B409 and 308.—On a handsome stand with an elaborate scaffolding effect in copper and copper alloys, the Metals Division of **Imperial Chemical Industries** present three main exhibits: A model representing the inlet end of a condenser used to demonstrate some operating conditions which produce failure of condenser tubes through erosion, corrosion, &c.; the use of aluminium alloys in coachbuilding; and the use of copper or aluminium alloy faced roofing panels.

Stands B309 and 208.—**The Incandescent Heat Co., Ltd.** display metallurgical furnaces and equipment for all industries, fired by gas, solid fuel, oil and electricity, and some interesting low temperature ovens. Other exhibits include mechanical rolling mill equipment, foundry equipment, and vitreous enamelling plants.

Stands D331 and 228.—One of the most attractive stands in the Fair was that on which the glass lettering spelled out **International Combustion, Ltd.** The exhibits included model water-tube boilers, pulverised fuel or stoker-fired, travelling grate and spreader stokers, and, among other things, a Gyrocene continuous centrifugal Tyrock full floating screen.

Stand B221.—Extremely active at the Fair are **Jenolite, Ltd.,** staging demonstrations and similar publicity operations. The numerous types of metal treatment concerned include derusting, descaling, rustproofing, aluminium keying solution, metal degreasing and metal blackening; soldering solutions and paste and acid free paint stripper are also shown.

Stand D Outdoor.—**C. H. Johnson (Machinery), Ltd.** exhibit a considerable range of heavyweight equipment including a run-about crane, concrete vibrators, portable conveyors, rammers, compressors, pile-drivers, pipe-laying winch, 2-, 3-, and 4-in. pumps, mud pumps, concrete mixer, and various other machines.

Stands A407 and 306.—Weighing machines and spring scales of many types are displayed by **George Salter & Co., Ltd.** for such varied application as industrial, agricultural, commercial, and domestic use. Springs of various kinds are shown, together with spring washers, testing machines, and roller bearings.

Stand B525.—**Donald Macpherson & Co., Ltd.** display a number of outstanding paint finishes, among them the gasholder and general steelwork protective paints, in which is now incorporated a proportion of synthetic resin manufactured in the firm's own plant. 'Synroz' synthetic four-hour drying enamels for engine and exhauster houses, canteens, and laboratories are also shown. The youngest member of the 'Foochow' family is 'Snappol' meter finish and this is amply demonstrated.

Stands D305 and 204.—In the belief that animation is the prime attraction, a model train contributes to the stand of the **Morgan Crucible Co., Ltd.** which displays furnace and foundry equipment, carbon brushes for electrical machines, carbon engineering parts, potentiometers, radio and heavy duty resistors, triangle refractories, and pure oxide ware.

Stand C416.—This very pleasant stand is devoted to **Morley Products (Padham), Ltd.** Here the emphasis is on gas boilers and washing machines in galvanised and porcelain enamelled finish.

Stand C414.—**Oldham & Son, Ltd.** present an attractive exhibit embracing a wide range of equipment. Included are miners' lamps and lighting equipment, battery charging equipment, automatic emergency lighting units, and air measuring apparatus and inflamable vapour detecting equipment. Typical of the latter is an interesting multipoint recorder and alarm system for industrial processes involving combustible gases or vapours.

Stands C519 and 418.—**Radiation, Ltd.** and its allied companies devote their admirable stand to the display of large scale cooking apparatus. In the forefront is the new Kingfisher fryer and the Grosvenor enclosed range. Other interesting items are two boilers, a two-tier model of the Confector pastry oven, a stockpot stand, and other large-scale equipment. The New World automatic water boiler B.R. 40/4 and industrial scale reducers are also shown.

Stand C707.—The variety of products exhibited on the stand of the **Rawlplug Co., Ltd.** is such that individual mention is impossible. However, certain selected devices worthy of comment include a girder clip which will take brackets at any angle for the carrying of pipes and cables, and Rawltools for hole boring of many sizes and types, including pneumatic boring tools.

Stands A327 and 226.—Pleasant in appearance, the stand of **R. Russell & Sons, Ltd.** is devoted to the display of the 'Dainty' gas cooker, which combines special cast iron construction with oven heat control and other attractive features.

Stand D129.—**Saunders Valve Co., Ltd.** demonstrate by means of large and small models the ability of the flexible diaphragm valves to close upon 200 fluids. Examples of galvanised iron, acid-resisting bronze and other metallic bodies are displayed, and the latest innovation is the 'Diaplug' model which can be 'rodded through' to break up hardened fluids.

Stand D648.—**Siebe Gorman & Co., Ltd.** specialise in breathing and resuscitation apparatus, and display on their interesting stand a wide variety of masks, diving apparatus, gas and dust masks, and other protective and medical apparatus.

Stand D337.—Pumps of many kinds are exhibited by **Sigmund Pumps, Ltd.** Of particular interest is the new range of PR peripheral pumps which cover outputs up to 50 g.p.m. and which obtain heads as high as 3-400 ft. with one impeller. Sigma process pumps are displayed in great variety, and there is an unusual aspect of pumping to be seen in the overhead irrigation equipment.

Stand C, C624.—**Henry Slack & Sons, Ltd.,** display an interesting range of gas washing machines and boilers on a pleasant and effective stand.

Stand B413.—A varied selection of stove, gas, water, and steam fittings are well displayed on the stand of **James Southerton, Martineau & Smith, Ltd.,** in addition to a number of spraying machines and lubricators.

Stand C421.—**Sperryn & Co.,** exhibited a range of Spersom gas thermostats for both domestic and industrial use, relay valves and flame failure devices, also spring-loaded, self-lubricating main cocks and other fittings.

Stand B719 and 626.—The **Stanton Ironworks Co., Ltd.,** included on this display spun iron pipes, special castings, concrete-lined spun iron pipes, and three types of flexible joints for gas and water mains. Flexible joints are demonstrated under air pressure, and there is an interesting display of historic pipe exhibits ranging from the first to the nineteenth centuries. On the outdoor *Stand B,* is a concrete general purpose shed in which are shown brick samples and various grades of dry and tarred slag.

Stand D145.—**Thomas & Bishop, Ltd.,** have a wide range of products of which the following may be particularly mentioned: Flexo belt treatment, Permac jointing material, Flexo tinning compound, furnace cement, jointing paste, Tebcon roofing compound, &c.

Stand B517 and 416.—**The Staveley Iron & Chemical Co., Ltd.,** display pig iron, and cast iron pipes of various types—sand-spun, metal-spun, and vertically cast. Also shown are flexible and patent joints, chemicals and by-products, and salt, &c.

Stand D, Outdoor, shows a range of Coles mobile cranes, exhibited by **Steel & Co., Ltd.** Included among these is a very fine 12½ tons model, fitted with a large grab, working from a 50 ft. jib.

Stand D215.—**Stelcon (Industrial Floors), Ltd.,** exhibit an excellent range of products connected with their industrial floors for which is claimed extreme hard wear. The Stelcon system of bicycle parking is also shown.

Stand D313.—Refractories for all purposes are shown by **John Stein & Co., Ltd.,** including firebricks, silica bricks, magnesite and chrome bricks, sillimanite and high alumina refractories, cements and patches, and glass tank blocks.

Stand D, Outdoor.—**Stewarts & Lloyds, Ltd.,** exhibit a Universal building of tubular steel, divided into ten bays each containing a selection of the Company's products. These include steel tubes and fittings for the conveyance of steam, gas, air, water, oil and sewage, &c., also joints and couplings, tubular steel coils, examples of protective linings, and foundry equipment. There is also an indoor exhibit on Stands D, 511 and 408.

Stand B, Outdoor.—**F. Taylor & Sons (Manchester), Ltd.,** have an interesting display featuring the hydraulically-operated mobile crane, with shovel equipment, elevating platform, fork lift attachment and other accessories.

Stand D301 and 200.—Of pillared construction and with an attractive heliotrope colour scheme, the stand of **Richard Thomas & Baldwins, Ltd.,** displays a range of flat rolled steel products, steel sheet, tinplate, alloys, and also Merchant Mill products and fabrications from steel and alloys in many forms.

Stand D430.—**James Walker & Co., Ltd.,** exhibit a wide variety of packings and jointings, including the well-known Lion brands and synthetic rubber precision seals.

Stand C300.—**Wellington Tube Works, Ltd.,** show a selection of products incorporating tubular construction, including an interesting, new handrailing joint. An important part of the display is a series of Weldex heaters, including a gas-fired air heater and a new range of convectors.

Stand C113.—**William Whitehouse & Co., Ltd.,** have a pleasing stand displaying brass gas fittings, main cocks, union cocks, joints, plug-in cocks, and various cooker cocks.

Stand D505.—**A. H. Wilkes & Co., Ltd.,** show a range of gas burners and injectors, industrial gas equipment, including a hot brass stamping furnace, tinning baths and melting furnaces, high-speed brazing apparatus, soldering iron stoves, &c.

Diary

May 13.—**London and Southern Junior Gas Association:** 'Scale Formation in Water Heaters Due to Hard Water,' R. Kerr, PH.D. (Nash & Thompson, Ltd.). Gas Industry House, 7 p.m.

May 18.—**London and Southern Junior Gas Association:** Visit to Stanton Ironworks, Nottingham.

May 18-19.—**Wales and Monmouthshire Association of Gas Engineers and Managers:** Annual Meeting, Colwyn Bay.

May 19-20.—**Eastern Association of Gas Engineers and Managers:** Annual Meeting, Clacton-on-Sea.

May 24.—**Southern Association of Gas Engineers and Managers:** Spring General Meeting, Connaught Rooms, Kingsway, W.C., 2.30 p.m. Paper by H. H. Brown. Council Meeting, 11 a.m.

May 25.—**Manchester District Junior Association of Gas Engineers and Yorkshire Junior Gas Association:** Joint visits to Rochdale Road Works and West's Gas Improvement Co., Ltd. 'A Review of Carbonising,' Mr. Gaskill (West's Gas).

May 26.—**Midland Association of Gas Engineers and Managers:** Summer Meeting. Solihull.

May 28.—**Scottish Junior Gas Association (Eastern District):** Annual General Meeting, Kirkcaldy.

May 31.—**Southern Association of Gas Engineers and Managers (Eastern District):** Visit to Hilsea Gasworks, Portsmouth.

June 2-3.—**Home Service Business Conference:** Gas Industry House.

June 10.—**London and Southern Junior Gas Association:** Annual General Meeting.

June 11.—**London and Southern Junior Gas Association:** Summer Visit to Southampton.

June 18.—**Scottish Junior Gas Association (Eastern District):** Annual Outing.

THE SELECTION AND DESIGN OF GAS CONDENSING PLANT*

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I SUMMARY AND CONCLUSIONS

In Section II, the introduction to this paper, the object is stated as being to provide managerial guidance on the specification and selection of water-tube condensers† and ancillary equipment.

Section III provides the authors' recommendations on specifying the duty the condenser is to perform. It indicates the relative importance of the various factors and emphasises the need for accurately forecasting the duty.

Section IV outlines the economic and technical criteria by which the designs should be assessed. The main economic consideration is defined as the total annual charges for operating the plant and it is shown that it is misleading to consider the initial capital cost alone. This must be evaluated as annual capital charges and compounded with annual water charges. The latter item may be found surprisingly high in relation to the capital expenditure even though the water is relatively cheap. The desirability of investigating the economics of a water cooling and recirculation system is emphasised. A plea is also made for further consideration of the optimum permissible gas pressure loss. The salient features of the several different forms the water-tube condenser may take are then outlined and the materials of construction are considered.

Section V, 'Arrangement of Plant,' discusses single-stage cooling in contrast to separated primary and secondary stages. Single-stage cooling is always the most economical, providing it is practicable. Its limitations are outlined in some detail. If two-stage cooling is practised, it is desirable to operate the primary and secondary condensers with series water flow in order to provide an economical design. Standby capacity is also discussed in this section and particularly the desirability of providing 'working' standby units, to avoid expenditure on standing plant, and to reduce the annual costs to a minimum by employing the total available cooling surface. The features of series and of parallel standby capacity are also outlined.

II INTRODUCTION—THE SCOPE OF THE PAPER

This paper deals with certain aspects of the specification and selection of gas cooling and condensing plant in the gas industry. Its subject matter has been restricted to the indirect water-tube condenser and its associated equipment as this is the type most commonly employed in the gas industry of Great Britain. No reference has been made to two other types of condensers, namely: (a) the atmospheric condenser which may be either of the annular type or of the serpentine tubular type (often water filmed and then somewhat analagous to the evaporative rack cooler), since very few atmospheric condensers have been installed in recent years; and (b) the direct cooler with its associated rack water coolers, since this type of plant has not as yet found any wide usage in the gas industry, mainly on account of its high capital cost. [But see Pexton, Dougill and Ravald.[9]]

The paper has been prepared from a 'management' angle. The management of a gas undertaking is concerned not with detailed design, but with the overall suitability in arrangement and running costs of an existing or projected installation. The authors have therefore endeavoured to discuss those matters which are important to this end, and not to set out the methods and data which are of concern to those engaged in chemical engineering design. Indeed, it is their view that while the design of condensers is now well understood (1-8), the specification of duty and requirements, and the selection of appropriate plant, have been somewhat neglected and merit the presentation of a paper of this type.

III SPECIFICATION OF DUTY

GENERAL.

It is important that the duty required of a condenser should be specified in as comprehensive a manner as possible. Although condensers are inherently flexible in respect of under- and over-loading, in that the volume of cooling water may be adjusted to deal with load variations (see Appendix B), the designer should be fully informed of such variations if he is to design the most economical unit. Unless the plant is operating on a base load, the data should include the average summer loading, the average winter loading and the incidence of peak loading.

It is customary to specify the volume, temperature, and saturation temperature of the gas at the point of entry to the condenser, the required outlet gas temperature and the temperature of the cooling water. These items will now be considered in turn.

GAS VOLUME.

This requires no comment beyond emphasising the point already made, namely, the provision of full information regarding the fluctuations which may be expected to occur.

GAS INLET TEMPERATURE AND SATURATION.

Inlet temperature and saturation are of particular importance as they have a far greater bearing on design than is generally realised by engineers other than designers. This may be illustrated in the following table which gives the approximate values of the heat content of *saturated* coal gas at temperatures between 60° F. and 150°-185° F.

Gas temperature (saturated gas) °F.	150°	160°	170°	180°	185°
Heat content between 60° F. and stated temperatures in B.Th.U./1,000 S.T.P. cu.ft....	18,800	26,400	38,100	57,500	72,900
Ratio of heat contents	1.0	1.4	2.0	2.9	3.7

Although the heat content of *unsaturated* gas is proportional to temperature, this table clearly indicates the fallacy of assuming a linear relationship between heat content and temperature of *saturated* gas. It also illustrates the importance of predetermining as accurately as possible, the temperature and relative humidity of the gas at the point of entry to the condenser. These figures will depend both upon the type of carbonising plant and its method of operation, and on the length of foul main between retort house and condenser. Carbonising plants employing high steaming rates and those with heavy flushing and spraying of gas offtakes and collecting mains will produce gas with high saturation temperatures. Long foul mains will result in lower temperatures although the heat content of the gas will not be reduced proportionately to the temperature reduction, both for reasons already given and because a long foul main gives the gas more time to become saturated with any excess moisture present. The physical process of saturation while resulting in a fall in temperature does not itself result in any change in the total heat content of the gas, but merely transforms sensible heat into latent heat. To exemplify this, gas at 200°F., saturated at 160°F., has exactly the same heat content as gas at 161.5°F. and saturated at that temperature.

To summarise, it will suffice to indicate that as realistic an estimate as possible of the inlet condenser gas temperature and saturation should be made, as this has such an important bearing on the heat-transfer duty required of the condenser. These figures should be given for the various gas loads.

OUTLET GAS TEMPERATURE.

This requires no comment other than to stress that it is undesirable to specify a closer approach than 5°F. to the temperature of the available water as this would result in an extravagant addition to the annual charges.

WATER TEMPERATURE.

This is an important factor in the design of a condenser as winter and summer temperatures may show a wide variation. The temperature differential between inlet water and outlet gas has an important influence on the mean temperature difference between water and gas, and both condenser size and water consumption are functions of this M.T.D. Accordingly the designer should be fully informed on the temperature variations of the cooling water and these should be correlated with the gas loading of the condenser.

MISCELLANEOUS.

The table given in Appendix B illustrates the effect of the variables so far discussed, both individually and collectively, as applied to a particular design. Although it will be seen that this design will cope with variations of the specified duty, it is worth remarking that the corresponding variations in the supply of cooling water necessary to maintain the outlet gas temperature at a constant value, range from 4,100 to 28,800 G.P.H. and that these would correspond with annual water costs ranging from £452-£3,150 p.a. based on a cheap water supply (3d./1,000 gall.) were the particular conditions prolonged.

It may not be inappropriate at this stage to mention that in view of the extreme importance of water costs (which may be

* A paper to the Southern Association of Gas Engineers and Managers (Eastern District) April 26, 1949.

† The authors have throughout accepted the established gas industry term condensers.'

inferred from the example quoted and which is dealt with more fully in Section IV) some Engineers may consider it desirable to specify the volume of cooling water to be employed (or the temperature to which it should be raised, which amounts to the same thing). If this is specified in addition to the usual duty data, alternative designs will be on a common basis and will be directly comparable. The alternative will be to make due allowance for annual water charges when comparing the designs (see Section IV).

In any case, the designers should always be aware of the cost of water and of any limitation it may be desired to impose on its maximum temperature (see Section IV), as these factors will play an important part in the design.

Similar considerations also apply to gas pressure loss through the condenser, which again should be specified to the designer when possible, but alternatively should be taken into account when assessing the several designs. (Section IV.)

IV ASSESSMENT OF DESIGN

(A) INTRODUCTION.

It is now generally realised that the water-cooled surface provided in a gas condenser is no longer of itself a criterion of the performance of the condenser. In the earlier years of the century it might have been sufficient to correlate cooling surface with price and so decide which of several alternative types of condenser to install, as with the low gas and water velocities then employed the surface did give some indication of the condenser rating. However, in modern practice the heat transfer coefficient (which is really the 'effectiveness' of unit area of cooled surface) may vary considerably according to the gas and water velocities employed in the several designs and so the size of the condenser may provide small indication of its rating. In any case, it will be argued below that initial capital cost must usually take second place to annual water charges which is likely to be the largest single item in the total annual charges. In contrasting alternative designs of condensers for a particular duty, it is therefore necessary to make a simultaneous correlation and assessment of the several factors which are now outlined:

ECONOMIC FACTORS.

(1) Annual capital and maintenance charges based on capital cost and depreciation of condensers and ancillary equipment.

(2) Annual running costs based on annual water consumption and cost of water per 1,000 gall. (The water may either be fresh water or recirculated water with make-up, and power costs for pumps, fans, &c., must be taken into account).

(3) Gas pressure loss through the condenser.

TECHNICAL FACTORS.

(1) Technical features of design.

(2) Materials of construction.

These several factors will now be dealt with in turn.

(B) ECONOMIC FACTORS.

The first two of the economic factors are mutually interdependent in that as a broad generalisation the larger the condenser (of a given design), the smaller the quantity of water necessary for cooling the gas. A balance must therefore be struck to arrive at the most economical condenser on the basis of total annual charges. The capital and maintenance charges are commonly taken as 12% p.a. of the capital cost and may be built up as follows:—

Interest on Capital, or Borrowing Charges	2½% p.a.
Depreciation (20 years life basis),	5 % p.a.
Maintenance and Renewals (incl. re-tubing after 10 yrs.)	4½% p.a.
Total Capital and Maintenance Charges,	12% p.a.

(*Note.*—The capital charges of foundations, valves and connections, instruments and controllers, &c., will be omitted, as they may be common to the alternative designs of condensers and will not affect the comparisons made below).

The running costs will be confined to water costs as this is the main item of expenditure, but it will be convenient for the purpose of this illustration to include the capital and running charges of any water coolers in this item.

If for the purpose of illustration and comparison this basis is accepted, it will be convenient to illustrate the further contentions by taking a specific example. Consider the following condenser which may be regarded as typical of modern practice.

Cost of Condenser (bare)—say approx.	£3,000
Capacity—cu.ft. per day	4 million
Gas inlet and outlet temps. (sat'd.)	165°-65°F.
Water inlet and outlet temps.	60°-125°F.
Water consumption	7,900 gall./hr. or 47 gall./1,000 cu.ft.
Water cooled surface	8,000 sq. ft. or 48 sq. ft./1,000 cu.ft./hr.
Gas pressure loss	1¼ in. W.G.

The annual capital charges will be 12% of £3,000, i.e., £360. Water may cost anything from ½d. to 1s. 3d. per 1,000 gall., according to its source and whether fresh or recirculated. (Appendix C gives examples of how these figures are derived.) The annual cost of water may thus range from £144-£4,330, which figures may be contrasted with the annual capital charges (£360).

The following inferences, although expressly relating to the example chosen, provide an indication of the general trends:—

1. If water costs 1½d./1,000 gall., the annual water costs equal the annual capital charges, which expressed in another way means that in just over eight years they equal the capital cost of the condenser. At 10d./1,000 gall. the cost of *one year's* water nearly equals the capital cost of the condenser.
2. With any but the cheapest water, any normal increase in the capital expenditure on the condenser, which significantly reduces the annual water charges, is likely to be rapidly repaid.
3. As a broad generalisation the capital cost of a condenser is relatively unimportant unless correlated with the annual water charges. For each condenser project an investigation should be undertaken of the optimum surface and water consumption (bearing in mind that they are inversely proportional within certain limits) to secure the lowest overall annual charges expressed as capital charges plus water costs. The technical limitations include the difficulty of a close approach of outlet water temperature to inlet gas temperature with certain types of water owing to the acceleration of corrosion resulting from decomposition of inorganic salts, de-aeration, &c., above certain temperatures. With some waters it may be considered undesirable to exceed 125° F. and this limit should not usually be exceeded if galvanised steel tubes are employed. However, despite such limitations there may still be scope for reducing the annual charges by increasing the surface and hence the capital cost of the condenser in order to reduce the annual water charges.
4. If water costs more than, say, 2d.-3d. per 1,000 gall., including pumping charges, the economic possibilities of a water cooling and recirculation system should be investigated. The technical and economic considerations involved in such systems cannot be dealt with at any length in this paper, but Appendix C gives some useful preliminary data and forms a guide as to the basis of such an investigation. It must be remembered that in summer certain difficulties may be experienced in obtaining sufficiently cool water from an atmospheric or even a forced draft cooling system, although this can usually be accomplished if one of the more efficient types of forced draft coolers is employed and is possibly supplemented by using cold fresh make-up water in the early water passes of the condenser.

These then are the main economic considerations underlying the design and selection of a single unit condenser. Enough has been said to show the fallacy of basing selection purely on the initial capital outlay. Public Authorities whose conditions of purchase specify that contracts should be awarded on the basis of minimum capital expenditure should be made aware of this.

As already indicated, the third economic factor—pressure drop—should preferably be specified so that all designs are compared on a common basis. If this is not done, due allowance should be made for the cost of operating the exhausters to give the required pressure head. The desirability of allowing a higher than normal pressure drop should also be considered.

The pressure loss in a condenser is proportional to the square of the gas velocity. Accordingly, doubling the gas volume and hence the gas velocity through a given condenser will increase the pressure loss to four times the original figure. But the heat transfer coefficient is also a function of the gas velocity and it is approximately correct to say that it varies to the .75 power of the gas velocity in the usual range of gas velocities involved. Hence if the gas velocity is doubled, the heat transfer coefficient is increased to about 170% of the original figure and the pressure loss becomes 400% of the original figure. Thus, at the expense of pressure loss alone, a given condensing surface will become something like 70% more effective when the gas volume and velocity are doubled. This illustrates the importance of pressure loss, in that the gas velocity employed, and hence the heat transfer coefficient obtained, is dependent on it. It will therefore be appreciated that the designer must be informed of the allowable pressure loss (or he will arbitrarily decide this figure for himself) before he can start on the condenser design.

In passing it may be said that the reduction in size of condensers in the last 20 years or so has been mainly due to the employment of much higher gas velocities than were previously employed and that this has resulted in a corresponding increase in the pressure drop. It may not be inappropriate at this stage to consider whether current practice has proceeded far enough in the direction of reducing the size and hence the annual capital charges of condensers, which would be made possible by lifting the restrictions still imposed on the gas pressure loss.

If a typical 4-5 mill. cu.ft. per day condenser with a gas velocity of 10 ft. per sec. and a pressure loss of 1.5 in. W.G. is considered, it may be shown that if the gas velocity were increased to 20 ft. per sec. and the allowable pressure loss to 6 in. W.G., the heat

transfer coefficient could be increased by about 66% ; or at 30 ft. per sec. and 13.5 in. W.G., by about 125%. In either case the capital cost and hence the annual capital charges would be considerably reduced, although not proportionately to the surface reduction. On the other hand the exhauster running costs would be increased by something like £110 and £290 respectively* in the cases under consideration. To make this worthwhile there would have to be a capital saving of about £900 and £2,400, respectively (based on 12% p.a. capital charges) in a condenser originally costing about £3,500. While in certain circumstances the former might be possible, the latter would most certainly not. The inference which may be drawn is that the optimum pressure loss in the example taken will be somewhere between 1½ in. and 6 in. W.G.

There are so many variables involved that each case must be considered on its merits, but the authors are of the opinion that if higher pressure losses than the usual 1-2 in. W.G. can be tolerated, it will be worth investigating whether it will not pay to allow them. In other words the present-day customary pressure losses are still somewhat below the optimum, which will probably be found to be between 2 in. and 6 in. W.G.

(C) TECHNICAL FACTORS.

The value of those features of design which make for ease of maintenance and replacements, and maintenance of efficiency over prolonged periods, will depend on the type of gas to be treated and the characteristics of the available water supply. If the gas is liable to deposit solid phase matter, attention will be directed to such means for its removal as steaming, flushing of the outer surfaces of the tubes and the employment of reversing gas connections. Effective flushing is by no means easy to secure and the arrangements should be subjected to close scrutiny. If the water is corrosive, special treatment of the inner surfaces of the tubes and water chambers may be indicated, whilst if the water has scale-forming properties or deposits sludge, ease of access to the tubes and means for flushing the sludge away will be important considerations.

TECHNICAL FEATURES OF DESIGN.

There are two main types of water-tube condensers, namely, the vertical tube type with the gas flow parallel to the tubes, and the so-called 'horizontal' tube type (in practice the tubes are inclined at an angle to the horizontal) with the gas flow normal to the tubes. With the introduction of the high velocity vertical tube condenser during the past 10-20 years, this type has now largely superseded the horizontal tube type on account of the ease of internal tube cleaning, which can be effected whilst the condensers are in operation, and the avoidance of corrosion due to trapping of air released from the cooling water, in pockets, such air being vented through the open tops of the condensers. Moreover, the vertical tubes are usually much longer than the horizontal tubes and there are consequently fewer tube expansions into the tube plates.

Horizontal tube condensers may still be employed if the water circuit operates under an appreciable pressure (as is sometimes arranged to avoid release of air from aerated water), as with this type of construction it is more convenient to design such units to withstand water heads much in excess of the static water head of the condenser.

Gas velocities of the order of 3-6 ft. per second (based on the gas volume measured at S.T.P.) are commonly employed with horizontal tube condensers, and of 6-12 ft. per second with vertical tube condensers. The reason for the higher velocities in vertical tube condensers may be explained as follows. At any specified gas velocity, the heat transfer coefficient and the pressure drop, of a given system, are much lower when employing parallel flow than cross flow. In practice it is found that something like twice the gas velocity used with cross flow, can be employed with parallel flow for any required pressure drop. This higher gas velocity brings up the heat transfer coefficient of the parallel flow unit to a figure approaching that obtained with the cross flow unit, although with conventional designs it is usually found that the velocity has to be more like 2.5 times that of the cross flow unit to obtain an equivalent heat transfer coefficient. The problem is complicated by the fact that a proportion of the surface in a parallel flow unit has cross flow (in the area when the gas is transferred from one gas pass to the next). It is not proposed to consider this matter in detail and it will now suffice to indicate that the parallel flow unit usually has a slightly larger surface than the corresponding cross flow unit, but that this is compensated for by the simpler construction.

The requisite gas velocities in vertical tube condensers are secured by multi-pass construction. From four to twelve passes are normally required according to (a) the heat load, and (b) any limitations which may be set on the height of the condenser (the higher the inlet gas temperature and saturation, and the more limited the head room, the more passes are required). It is usual to arrange up to six passes in a single line, and any greater number, in two lines, in vessels of substantially rectangular cross section. If only four, or at most six passes are involved, they may often be advantageously disposed in sectoral form in a cylindrical vessel. This form of construction is favoured by the designer on account of its ability to withstand pressure or vacuum without any special stiffening of the shell.

No attempt has been made to describe all the forms of construction which are available. The salient features of the commoner forms of construction have been indicated so that the Gas Engineer may be able to assess the relative merits of the several proposals put forward by the designers.

MATERIALS OF CONSTRUCTION.

Mild steel construction which has been increasingly adopted in recent years, does not set the same limitations on the chemical engineering design as cast iron, as with the latter form of construction it is often difficult to arrange for optimum gas and water velocities owing to the larger clearances between shell and tubes and the wider pitch centres of the tubes themselves. Mild steel also results in a much lighter structure, uses less metal and is usually considerably cheaper, particularly when electrically welded fabrication is employed as is now a common practice. It is, of course, necessary to arrange for the adequate stiffening of the shell plates, particularly with secondary condensers operating on the pressure side of 'pulsating' type exhausters, but this can easily be arranged without detriment to the appearance of the vessel.

It is also true that the life of a mild steel condenser will probably be appreciably shorter than that of a cast iron condenser. Earlier in this section, under 'Economic Factors,' it will be noted that costs are based on 20 years' life. This may be regarded as a minimum, but it is now suggested that such a life should be adequate for most gasworks 'process' plant as in this time, even if the unit has not actually worn out, its design will probably have become obsolescent and conditions are likely to have changed to such an extent that the unit would in any case be due for replacement.

V ARRANGEMENT OF PLANT

(A) SINGLE STAGE v. TWO-STAGE COOLING.

While the authors would like to enunciate some guiding principles, one of the objects of this section is in some measure to canvass opinion on this subject.

The greatest economy in cooling is obtained when there is complete cooling in a single-stage unit. This is usually practicable when cooling gases with a low naphthalene content, as from continuous vertical retorts. Gas may readily be cooled in a single-stage from inlet temperatures of up to 185° F. saturated, down to outlet temperatures within 5° F. of the cooling water temperature. In these circumstances the capital cost of the condensing units is reduced to a minimum, as is also the water requirement.

However, two-stage cooling is usually considered desirable with gas with a high naphthalene content. There are several ways in which the plant may be arranged in these circumstances. Pexton, Dougill and Ravald[9] recommend cooling down to 60°-65° F. in primary condensers equipped with reversing valves. They also recommend the provision of means for heating up the central passes of the condensers either by water by-passing arrangements, or by curtailing the water supply to the condensers as a whole, one at a time. By these means the naphthalene which is deposited on the condenser tubes is partly dissolved by the tar and partly driven forward from the condensers through the exhausters and first-stage electro-detarrers into a naphthalene washer. There the gas is stripped by oil washing, down to a naphthalene content corresponding with a saturation temperature below which the gas will not subsequently be cooled. Second stage cooling may then be effected without incurring naphthalene blockages at the cold end of the condensers.

Another arrangement, for which they have stated a preference, is to substitute direct coolers for the indirect primary condensers in the above sequence.

Alternatively the gas may be cooled in primary condensers to a temperature slightly above that at which any serious condensation of naphthalene would occur, *e.g.*, 95°F., or possibly less if provision is made for removing such naphthalene by flushing. After passing the exhausters, the gas is then re-cooled to the desired minimum temperature in a secondary condenser which is equipped for heavy flushing of the tubes with a specially selected tar of suitable viscosity, in order to dissolve the deposited naphthalene.

Other arrangements of plant will occur to the Gas Engineer, but the two cited above typify modern practice.

Two-stage cooling is also practised when a semi-direct ammonia recovery plant is employed, as the partially cooled gas must be reheated to a temperature well above its dew point before passing through the sulphuric acid saturators and is subsequently cooled in a second-stage direct cooler. This is, of course, standard coke oven practice.

Two-stage cooling is again practised when the pressure rise required of the exhausters is such as to result in a serious temperature rise of the gas. This rise may amount from 5°-15° F. according to the type of exhauster employed and the degree of

* Based on 0.4—0.5 B.H.P. per 1 in. W.G. per 100,000 cu. ft. per hour and power at 1d. per unit.

compression; it is also dependent on whether the gas re-saturates itself at the higher temperature, but this is by no means always the case. Whether or not to employ a secondary condenser will then depend on the extent of the temperature rise and whether the liquor is concentrated or disposed to waste. The only object of operating ammonia scrubbers at a low temperature is to provide as strong an ammoniacal liquor as possible, while at the same time reducing the ammonia content of the gas to 4-8 grains per 100 cu.ft. If the liquor strength is immaterial there is no difficulty in providing the required ammonia-in-gas concentration at any temperature normally encountered.

If two-stage cooling is practised, for any of the several reasons given, the most economical arrangement of the primary and secondary condensers is secured by operating them with the water flow in series, *i.e.*, taking the water from the outlet of the secondaries to the inlet of the primaries. In these circumstances the two condensers combined will be little larger than a single-stage condenser (the only difference will result from the exhauster reheat); in fact, the first and second stage condensers will usually be equivalent to two physically separated sections of a single-stage condenser, and the additional cost will be small. On the other hand if for any reason separate water supplies have to be provided for the two-stages, then either the capital cost or the water cost of the two separate units will greatly exceed that of the single-stage unit. This will be clear if the duties are contrasted. The heat content of gas between 180° F. and 90° F. saturated is of the order of 55,000 B.Th.U. per 1,000 S.T.P. cu.ft. and that of gas between 90°F. and 60°F. saturated about 2,200 B.Th.U. per 1,000 S.T.P. cu.ft. Accordingly, in a single-stage condenser there will only be a small rise in inlet water temperature at a point corresponding to that at which the gas has been cooled to 90° F., both on account of the relatively low heat content of the gas at 90° F. saturated, and of the necessity of maintaining a reasonable mean temperature difference between gas and water in this part of the condenser. If now the condenser is physically sub-divided at the point where the gas reaches 90° F. and a separate water supply is provided for the secondary condenser, the volume of water required will still be identical to that employed for this duty in the single-stage condenser and the water requirement of the primary condenser will only be slightly reduced on account of the slightly improved mean temperature difference. Thus separate water supplies to the sub-divided units would result in the employment of nearly twice the water requirements of a single-stage condenser, and as will be seen in Section IV of this paper, would greatly increase the total annual charges.

Alternatively, of course, the secondary condenser could be provided with a much larger water cooled surface thereby reducing the necessary mean temperature difference between gas and water and hence the water requirements. But the M.T.D. is always low in secondary condensers and without entering into the designer's problems in further detail it may be said that the annual charges for secondary cooling are always high in relation to the heat load when separate water supplies are employed.

Hence two-stage condensers should always be provided with series water-flow between them when possible. As all modern condensers are of multi-pass design any desired split of liquor condensate may readily be provided irrespective of the number of separate unit condensers.

(B) STANDBY CAPACITY.

The subject of standby capacity will first be considered in relation to single-stage cooling.

In general the maximum unit size for a single-stage condenser ranges from 8-12 mill. cu.ft. per day, according to inlet gas temperature and saturation; or expressed in another way it is unusual to design single unit condensers for a heat extraction duty exceeding about 25 mill. B.Th.U./hr. as the unit would become cumbersome. To simplify the recommendations which follow let it be assumed that the largest single unit condenser has a capacity of 10 mill. cu.ft. per day. If the required duty exceeds this capacity, then two or more units in *parallel* will be employed. As it will be usually desirable to have some additional capacity available should one of the units require servicing, it is recommended that with multi-unit installations of this type, the condensers should be so rated, that with one unit off, the remaining unit or units should be somewhat (but not unduly) overloaded, bearing in mind that the pressure drop in a condenser will vary as the square of the gas load and that within limits, the increased heat load can temporarily be accommodated by increasing the water flow (see Appendix B) and also by allowing the outlet temperature to rise somewhat. There is usually no need to have 100% standby capacity, although should this for any reason be desired, the authors would recommend that such 'standby' condensers should normally share the load with the remaining units since there is little point in locking up capital in a standby unit, which may deteriorate as much in standing as in use, but which if operated would reduce the water consumption and hence the annual charges.

These contentions may be illustrated in the following examples:—

(1) For a duty of 12 mill. cu.ft. per day the employment of two 9 mill. cu.ft. condensers is to be recommended. If one were off for servicing, the other would have to deal with a 33% overload (based on its nominal rating and if the maximum gas makes were involved, as might be the case in winter). It would do this at the expense of pressure loss, which would increase to about 180% of the nominally rated figure; and by temporarily increasing the water consumption of the remaining unit by 100% so that it was equivalent to that used when two units were employed; and in a typical case by cooling the gas to within 15° F. of the available water temperature in place of the usual 5° F. margin. If the water could be increased by 133% of the original figure, the gas could be cooled to within 5° F. of the water temperature.

The employment of two 9 mill. cu.ft. condensers is, of course, arbitrary and it could be, for example, two 8 mill. cu.ft. condensers, when if one were off the other would be 50% overloaded and the pressure loss would become about 225% of the rated figure. It could be arranged that the performance under over-load conditions would be similar to that in the example cited above, except that the volume of water employed would always be somewhat higher. The particular rating chosen will depend on the Engineer's estimate of how often the condensers may be called on to cool the specified maximum gas volume, and the temporarily allowable pressure drop,

(2) For a duty of 18 mill. cu.ft. per day, the employment of three 7 mill. cu.ft. condensers is to be recommended. If one were off for servicing, the remaining units would be 29% overloaded and the effect would be similar to that cited in the first example above.

(3) For a duty of 24 mill. cu.ft. per day, possible alternatives would be three 9 mill. cu.ft. condensers when two working units would be 33% overloaded, or even four 6 mill. cu.ft. units when three working units would again be 33% overloaded.

Enough examples have been given to illustrate the principles underlying the design of multi-unit installations operating in parallel and of such capacity as to provide 'working' standby capacity.

However, the considerations involved with the smaller undertakings, when the required capacity is well below that of the largest single unit condenser normally supplied, may be rather different. In such cases consideration should be given to the provision of standby capacity in the form of series units, for the following reasons.

It will be seen from the examples cited that parallel standby can best be obtained in *twin* units by rating the two units well above the required capacity and preferably at 150% of the normal duty (e.g., two 9 mill. units for a 12 mill. duty), to avoid serious overloading when only one unit is working. It is only when three or more units are involved that standby capacity can be provided without any over-rating of the individual units. For large undertakings the provision of multi-units is essential and the modest excess ratings suggested do not result in any serious financial burden. On the other hand with the medium and smaller works, the need for standby plant is equally felt, but costs have to be watched more closely, particularly in that small condensers are more costly per unit capacity than larger ones. Hence, although for a 4 mill. cu.ft. gas make, two 3 mill. cu.ft. units in parallel could be employed to provide reasonable 'working' standby capacity, a more economical solution may be sought. It is in such cases that consideration may be given to series standby capacity. Providing there is a plentiful water supply available in an emergency this can be achieved without providing additional surface and, in fact, without any radical change in the condenser design, merely by the physical sub-division of a single-unit condenser into two separate sections operating in series. The additional capital cost is in these circumstances almost entirely confined to the cost of the extra valves and connections.

If a 4 mill. cu.ft. per day 8-pass condenser is involved it would be split into two 4-pass units operating in series for gas and water flow. If one half required servicing the other half would take the full gas load and the pressure loss would be reduced to approximately half the normal figure. The water flow would be increased to double the original figure and in a typical case the gas temperature would be reduced to within 20° F. of the water instead of the usual 5° F. differential—admittedly an appreciable increase, but only for the period of repairs. If the condenser were not dealing with the maximum specified volume, the approach to the water temperature would be closer, as it would also be if the water supply could temporarily be trebled. (This would give a 12° F. differential.)

Had the unit been divided on its other axis (*i.e.*, on the axis parallel to the gas flow, instead of normal to it) in order to subdivide the condenser into two units operating in parallel, the gas could only have been treated in one section at the expense of an excessive pressure drop, *i.e.*, 400% of the original figure—which is more than could usually be tolerated. The advantages of having

'working' standby capacity, by operating the units in series, will in such circumstances be apparent.

Another example of the advantages of series operation is when an old low velocity type condenser requires supplementing with a new unit. The old unit is then employed as the primary condenser where its relatively large surface area will be more effective owing to the higher (hot gas) velocity, and the higher M.T.D., and the new high efficiency unit is put in the more difficult secondary position, the water flow being in series through the two units.

An interesting exception to this principle was the case where two old single-pass condensers operating in parallel required augmenting to deal with an impending 100% increase in the gas load. In this instance the two old units were put in series, thereby increasing the gas velocity through each unit to twice the original figure and hence the pressure drop through each unit to four times the original figure, and of the installation as a whole to eight times. The original figure, which was only 0.125 in. W.G., thus became 1 in. W.G. The new unit to deal with the additional gas was then designed for a similar pressure drop (1 in. W.G.) and put in parallel with the old units, themselves in series.

Occasionally proposals are made for providing condensers to operate in series, or in parallel, at will. In the authors' opinion there can be no possible advantage in this arrangement for reasons given in Appendix D.

Although this section has only dealt with single-stage condensers, primary condensers may be treated on similar lines. Secondary condensers, in many instances, may not be considered of vital importance in ensuring continuity of gas production and accordingly may often have no standby capacity.

The authors wish to thank their colleagues (and in particular Mr. E. A. D. Saunders) for their help in the preparation of this paper.

APPENDIX A.

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APPENDIX B.

TABULATED DATA ILLUSTRATING THE FLEXIBILITY OF PERFORMANCE OF A TYPICAL MODERN CONDENSER AND THE CORRESPONDING VARIATIONS IN RATE OF WATER FEED REQUIRED.

Duty	Gas make (mill. cu.ft./day)	Approx. pressure loss (in. W.G.)	Gas temperature (°F.) In	Gas temperature (°F.) Out	Heat load mill. (B.Th.U./hr.)	Water temperature (°F.) In	Water temperature (°F.) Out	Water rate (g.p.h.)	Annual water cost at 3d./1,000 gall. (£)
Design duty	4	1¼	170	65	6.3	60	120	10,500	1,150
Reduced gas make	3	¾	170	65	4.7	60	127	7,100	776
Increased gas make	5	2	170	65	7.9	60	114	14,700	1,610
Reduced inlet gas temperature ...	4	1	160	65	4.4	60	113	8,200	900
Increased inlet gas temperature ...	4	1¾	180	65	9.5	60	109	19,400	2,120
Reduced inlet water temperature ...	4	1¼	170	65	6.3	50	130	7,900	862
All worst conditions	5	2½	180	65	11.9	60	101	28,800	3,150
All best conditions	3	½	160	65	3.3	50	129	4,100	452

APPENDIX C.

WATER COOLING SYSTEMS.

When the cost of fresh water exceeds, say, 2d.-3d. per 1,000 gall., the economics of cooling and recirculating systems should be investigated, as the typical examples given below indicate that the cost of recirculated water may vary from 1d.-4d. per 1,000 gall., according to circumstances.

The precise cost of such water will depend on the following factors:—

(a) The volume of water to be cooled.

(b) The cost of the fresh water make-up.

(c) The temperature range over which it is to be cooled, and the corresponding ambient temperature and humidity (this may be referred to as the 'wet bulb temperature').

(d) The proprietary cooling system employed and particularly whether a natural draft or a forced-draft cooler is used.

(e) The cost of electric power for water pumps and air fans (if any).

The factors (c) and (d) above are related in that only by employing a highly efficient type of forced-draft cooler is it possible to cool the water to within about 3°F. of the wet bulb temperature, the maximum readings of which may in the summer months average 62°F. (see Pexton (9) and Spivey (5, 8)) and hence to supply water at 65°F. as the average of the maximum monthly temperatures.

Atmospheric coolers of the open-sided type are not usually suitable for employment in gasworks where they would usually be too sheltered for efficient operation, but sometimes when the duty is not too arduous, a case can be made for natural chimney draft type coolers on account of the power saving.

In the examples given below a modest duty has been selected in order to contrast several different types of coolers, but if the duty involved is more exacting (and in particular, a closer approach to the wet bulb temperature is required) the cost of the cooler and hence of the cooled water may increase. Each case must therefore be considered on its own merits.

The basis on which the figures have been calculated, is as follows:—

(a) DUTY.

To cool water from 120°F. to 65°F. with an ambient temperature of 55°F. and 75% relative humidity, corresponding with a wet bulb temperature of 51°F.

(b) CAPACITY.

Typical capacities of 3,000, 8,000, and 15,000 gall. per hour have been taken.

(c) CAPITAL COST.

The cost of various proprietary unit coolers has been taken (1948 basis), including foundations, pumps (one working, one standby), fans (if any) and 100 ft. of pipe lines with valves.

(d) ANNUAL CAPITAL CHARGES.

These have been assessed at 12% p.a., a round figure covering all capital, depreciation and maintenance charges for coolers, pumps, fans, pipe lines, &c. This figure has then been expressed in terms of pence per 1,000 gall. of water.

(e) POWER COSTS.

These are based on an A.C. supply, and a charge of 1d. per unit. (The total head on the pumps from all causes is assumed to be 50 ft. The pumps draw from the water cooler sump, and

deliver to the condenser from whence the water gravitates back to the cooler.)

(f) MAKE-UP WATER.

A figure of 10% for make-up water has been taken to allow for evaporation losses (1% for each 10°F. cooling, which in this example totals 5.5%), windage losses and bleed-off for the deconcentration of solids in the water.

NOTE.

On the basis given the cost of water pumping alone ranges from approximately ¼d.-½d. per 1,000 gall., according to the volume pumped. This then is the irreducible minimum cost of water at a condenser if the water is free of all but pumping charges.

(2) 5 mill. cu.ft., less efficiently, in either of the two sections, with 4 in. P.D.
(3) 2½ mill. cu.ft., efficiently, in the whole condenser, with ¼ in. P.D.
(4) 2½ mill. cu.ft., efficiently, in either section, with 1 in. P.D.

There would never be any advantage in providing gas connections to enable these two sections to operate in series, as the P.D. would be excessive (8 in. on 5 mill.).

It will thus be seen that each system of division has certain advantages and certain disadvantages, but that there is no division possible whereby the advantages of both systems can be combined, save in case (Z) referred to below. There is thus no advantage in arranging for series and parallel operation as if designed for series, the parallel connection would never be employed, and vice-versa.

CASE Z—shows another arrangement when the condenser would be divided into four parts and 10 gas valves would be used. It is not therefore recommended, although it would provide the most flexible arrangement in that 5 mill. cu.ft. could be cooled fairly efficiently in any three of the four sections, with a P.D. of about 2½ in. W.G., and of course 2½ mill. cu.ft. could be cooled efficiently in two of the four sections in series, with 1 in. P.D.

COST OF WATER FROM COOLERS.

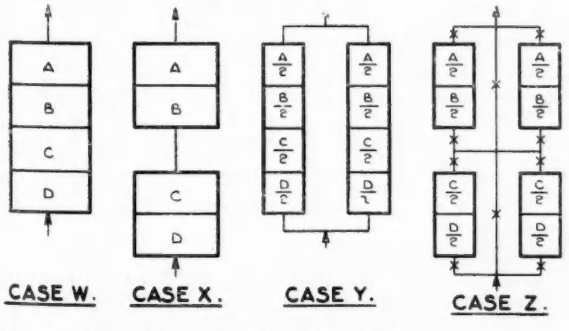
Type of cooler	Natural draft 'open' type (Make 'A')			Natural draft 'chimney' type (Make 'B')			Forced draft steel-shell type (Make 'A')			Forced draft concrete shell type (Make 'C')*		
Capacity (g.p.h.)	3,000	8,000	15,000	3,000	8,000	15,000	3,000	8,000	15,000	3,000	8,000	15,000
Total capital cost (£)	800	1,200	1,850	1,750	2,500	3,300	900	1,400	2,000	1,950	4,000	5,700
Capital charges (in pence per 1,000 gall.)	0.88	0.49	0.41	1.92	1.03	0.72	0.99	0.58	0.44	2.14	1.65	1.25
Power charges, pumping (in pence per 1,000 gall.) ...	0.44	0.35	0.32	0.44	0.35	0.32	0.44	0.35	0.32	0.44	0.35	0.32
Power charges, fans (in pence per 1,000 gall.)	—	—	—	—	—	—	0.68	0.67	0.66	*0.32	*0.30	*0.28
Make-up water costs :												
(a) Water at 3d./1,000 gall. (in pence per 1,000 gall.)	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
(b) Water at 6d./1,000 gall. (in pence per 1,000 gall.)	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
(c) Water at 1s./1,000 gall. (in pence per 1,000 gall.)	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20
Total cost of recirculated water based on make-up costs above (a) (in pence per 1,000 gall.)	1.6	1.1	1.0	2.7	1.7	1.3	2.4	1.9	1.7	3.2	2.6	2.2
Total cost of recirculated water based on make-up costs above (b) (in pence per 1,000 gall.)	1.9	1.4	1.3	3.0	2.0	1.6	2.7	2.2	2.0	3.5	2.9	2.5
Total cost of recirculated water based on make-up costs above (c) (in pence per 1,000 gall.)	2.5	2.0	1.9	3.6	2.6	2.2	3.3	2.8	2.6	4.1	3.5	3.1

* Can be operated as a natural draft "chimney" type when climatic conditions permit, by opening flap doors in the base. Power charges for fans assume 9 months operation during year.

APPENDIX D.

CONDENSERS FOR SERIES AND PARALLEL OPERATION

The following reasoning will show there can be no possible advantage in arranging for condensers to operate in series and parallel at will. Consider a 5 mill. cu.ft. 4-pass condenser with a P.D. of 1 in. W.G. The diagrams show how it would be arranged if it were required to divide it into two separate sections operating in series, and in parallel. It will be shown that if the series division is chosen, the arrangement would be unsuitable for parallel operation, and vice-versa.



CASE W—shows the undivided condenser.
CASE X—shows the condenser arranged for series division. In these circumstances it would cool:—

(1) 5 mill. cu.ft., efficiently, with 1 in. P.D.
(2) 5 mill. cu.ft., less efficiently, in either of the two sections, with ½ in. P.D.
(3) 2½ mill. cu.ft., efficiently, in the whole condenser, with ¼ in. P.D.
(4) 2½ mill. cu.ft., less efficiently, in either of the two sections, with ⅛ in. P.D.

There would never be any advantage in providing gas connections to enable these two sections to be operated in parallel, as they would not be efficient at any loading.
CASE Y—shows the condenser arranged for parallel division. In these circumstances it would cool:—

(1) 5 mill. cu.ft., efficiently, with 1 in. P.D.

SHORT COURSE FOR TEACHERS

The Ministry of Education will be holding a Short Course for Teachers of Gas Engineering and Gas Fitting at Crewe Hall, Sheffield (University of Sheffield), from July 3 to July 9. The Course will be under the direction of Dr. P. C. L. Thorne, H.M. Inspector, who will be assisted by other inspectors and experts.

The purpose of the Course will be to consider the methods of instruction in Gas Engineering (Manufacture and Supply) and in Gas Fitting, and will include lectures and discussions on teaching methods and devices, on the use of the voice, of the blackboard, and of other visual aids. The treatment of the standard syllabuses for these subjects will also be considered. There will be lectures on some modern aspects of gas manufacture, distribution, and utilisation and a number of visits to works of various kinds will be arranged.

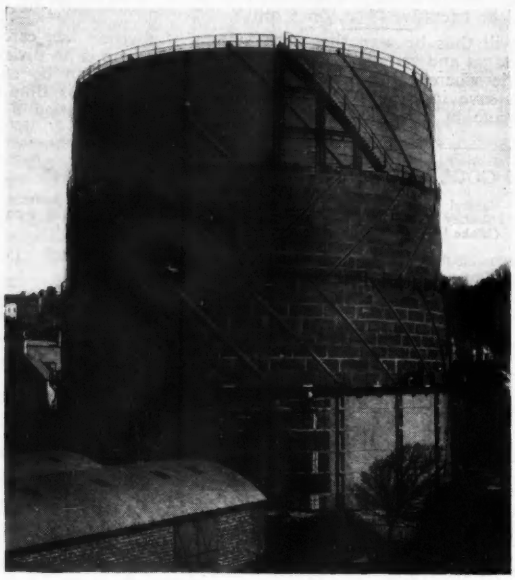
Accommodation will be available at Crewe Hall for a limited number of teachers. The charge for the period of the Course for bed, breakfast, lunch, and dinner will be £4 10s. Members coming from a distance will be expected to avail themselves of this accommodation as far as possible. No tuition fee will be charged for attendance at the Course. The Ministry will, subject to regular attendance and compliance with the rules of the Course, be prepared to repay the expenditure on travelling necessarily incurred, if, and so far as, this expenditure exceeds 10s. For members travelling daily from their homes, the Ministry's grant under this paragraph towards a member's travelling expenses throughout the Course will not exceed £1.

The Institution of Gas Engineers is prepared to refund the cost of residence and the balance of the cost of travel to teachers whose attendance at the Course is approved by the Ministry.

Application for admission must be made to the Ministry of Education (Teachers Short Courses), 20, Belgrave Square, London, S.W.1, on Form 106 Trs. (S.Cs.), obtainable from Local Education Authorities or from the Ministry, and should reach the Ministry in accordance with the directions on the form not later than May 26.

NEW GASHOLDER AT JERSEY

Our illustration shows the gasholder recently completed at Jersey by Saml. Cutler and Sons, Ltd. The opening ceremony took place on April 4 in the presence of the Bailiff of Jersey, Sir Alexander Coutanche, and a distinguished company of Jersey officials.



The new holder is of three lifts with a capacity of 750,000 cu.ft. contained in a steel tank, and represents the fifth gasholder to be erected at Jersey by Saml. Cutler and Sons, Ltd., the first one being installed in 1877.

'PREMIX' GAS AND AIR INCORPORATOR

Gas has come into its own as a means of producing heat for practically every type of industry; but in many areas there are still to be found even large firms still carrying on with gas-heating plant which is not producing to full capacity. With the need for increasing the national output and producing more goods at lower cost, it is necessary that attention should be paid to reducing industrial heating overheads in the factory, the foundry, the annealing shop, and the tool room. To this end attention here is drawn to the 'Premix' system for which Radiant Heating, Ltd., are responsible.

The 'Premix' patent gas and air incorporator ensures complete mixing of gas and air by mechanical means and it provides against fluctuations in gas pressure. A governor reduces the pressure of the gas to atmospheric, so that the gas which enters a slide mixing valve to meet the air intake is at the same pressure as the air. A rotary compressor thoroughly admixes and compresses the gas and air for delivery to the service mains. Any fluctuation in works demand is immediately registered by a special type relief valve which transmits the impulse to the mixing valve. As a result, the intake of both gas and air, while remaining constant in proportion, is regulated in volume to accord with varying works requirements. The 'Premix' incorporator, being automatically controlled, requires no operators. Once set, it runs itself without supervision. By its use, pre-determined temperatures can be guaranteed for long periods to within plus or minus 5°C., and the volumes of gas and air can be regulated to any desired proportions.

For many high temperature operations a 100% mixture is now frequently employed. This consists of five parts of air to one part of gas, and in the 'Premix' system the use of injectors is dispensed with. Exceedingly high temperatures are possible without the use of any pre-heating device, because velocity is maintained right up to the burner head. With the system furnace conditions (such as back pressure) have no ill effect.

In many industries where the efficient firing and maintenance of industrial heating equipment is of importance, the system is giving excellent service. Firms which have installed it have found that the appreciable saving of gas, operatives' time, and valuable floor space has quickly justified the initial outlay. To these advantages must be added reduction in labour costs, material, and plant maintenance, as well as increased output of better products.

PARKINSON AND COWAN, LIMITED

The Forty-Ninth Annual General Meeting of Parkinson and Cowan, Limited, was held in London on May 5.

Sir GEORGE JESSEL, BT., M.C., the Chairman, in the course of his address, said: During 1948 we enjoyed satisfactory trading conditions in most of our enterprises and earned consolidated gross profits of £299,143 (£243,254 last year). After deducting depreciation, taxation, and all other charges the consolidated net profit is £94,186, against £83,824. Out of earnings of 19% an Ordinary dividend of 7% is recommended, against 5%, and this decision represents an honest effort to reconcile the policies of the Chancellor of the Exchequer with the rights of our ordinary stockholders. We feel that we have exercised 'moderation and restraint' in this matter in line with the undertakings recently given by so many great companies.

After providing for the 7% Preference dividend there is a balance of £47,609 to be retained by the Company, of which £34,353 has been applied to the reduction of goodwill, which now stands at £100,000. Reserves and undivided profit total £366,800.

Deferred repairs has received £13,789, against £10,000. The fixed assets are slightly lower at £521,510, notwithstanding the expenditure during the year of £88,000 on new plant, buildings, and equipment. Depreciation has absorbed £82,843, against £75,454.

The financial position is strong and sufficiently liquid to give the mobility needed in changing circumstances. During the year we have exercised an option to convert the Debenture stock from a 4½% to a 3½% basis.

Wide Range of Operations

We own 11 subsidiary companies, are part owners of a company operating in South Africa, and have financial affiliations in other countries.

Stockholders and the public may not realise the extent and diversity of our manufacturing interests. Commencing with the manufacture of gas meters in 1816, we continue to occupy a leading place in this field and in the manufacture of gas cookers, fires, water heaters, street lighting equipment, and paint-drying plant; we also produce water meters and hydraulic apparatus, electricity meters and instruments, oil-burning appliances, precision components, leather for use by many industries, &c. This diversity is a blessing from the viewpoint that a temporary lapse in the profitability of one activity can be absorbed by the others. The fact that a high proportion of our home business lies with the nationalised gas and electrical industries will probably have little effect on our future. Customers will, as before, judge us on quality and service.

Developing Export Business

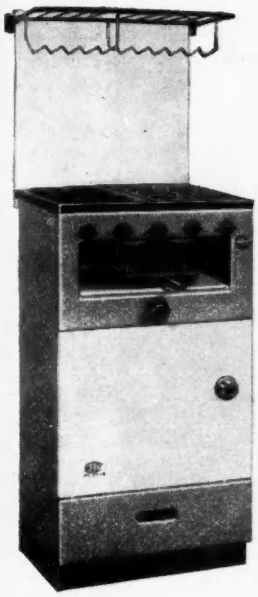
In the last two years representatives and executives visited North and South America, Africa, Australasia, India, the Near East, and the Continent to extend our already considerable overseas business

We have confidence in our people, our products, and in the line of policy we pursue. We base our hopes for future progress on conservative finance, a willingness to take measured risks, and an over-riding aim to develop within the group the most proficient technical, commercial, and administrative brains we can find.

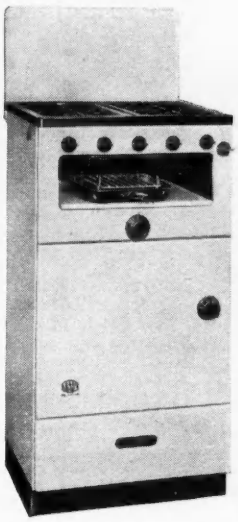
The Chairman concluded with thanks to the Managing Director (Mr. H. P. Barker) and to the staff and workpeople.

The reports and accounts were adopted.

The Summer Meeting of the Institution of Heating and Ventilating Engineers will be held at Eastbourne from June 20-22. A Council meeting will be held on the first day, followed by a civic reception in the evening. At the general meeting of members on the following day a paper on 'Education in the Heating and Ventilating Industry with special reference to the National College' will be given by Mr. D. H. Ingall, D.SC., HON.M.I.H.V.E. A banquet and dance will be held in the evening at which cups and prizes will be awarded to the winners of sports tournaments which are to take place in the afternoon. A farewell lunch will conclude the proceedings on June 22 after a motor coach tour and other tournaments in the morning.

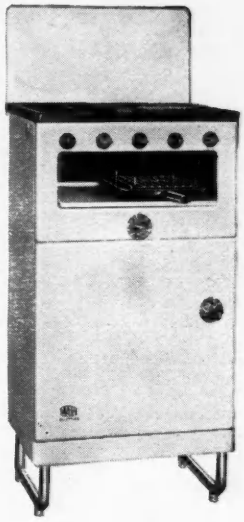


177 with platerack and backplate; 4 boiling burner hotplate; 14" oven; plinth base; dapple/white finish.



177 with short splash-plate; 4 boiling burner hotplate; 14" oven; plinth base; cream/black finish.

177 with platerack and backplate; 4 boiling burner hotplate; 16" oven; cast iron legs; dapple/white finish.



177 with short splash-plate; 3 boiling burner hotplate; 16" oven; tubular legs; cream finish.

Both the 14" and 16" ovens are of the bottom-flue two-burner type and embody features resulting in improved cooking performance. The 14" size oven has TWO grid shelves; the 16" has THREE . . . the lowest grid in each is fitted with cross wires to hold plates on edge for warming. Other features include the reliable Mainstat cooking control . . . patent door stop . . . door frame machine-faced to ensure a close fit . . . cast-iron plates recessed into lower parts of the side linings to protect them from overheating. Oven and door linings are finished in vitreous enamel . . . grids and hangers are in dull chromium plate.

CHOICE OF 177 FEATURES

Platerack and backplate, or short splash-plate . . . Hinged cover with shelf . . . Oven heights: 14" or 16". (Portal, 14" only) . . . Hotplates with 3 or 4 boiling burners and a high-speed grill . . . Cast iron legs, plinth base or tubular legs . . . finishes are in dapple/white, or cream black.

COOKER

with a choice of interchangeable features

R. & A. MAIN LIMITED · LONDON and FALKIRK

B.G.C. HONOURS MR. J. R. W. ALEXANDER

At Gas Industry House on April 29, the staff of the British Gas Council, which came to an end on the nationalisation of the gas industry, said goodbye to their General Manager, Mr. J. R. W. Alexander, and presented him with a 50-year-old French carriage clock and an illustrated volume in embossed leather containing their signatures and the inscription—'An expression of good wishes for his future prosperity from the Officers and Staff of the British Gas Council and an appreciation of his leadership under private enterprise.'

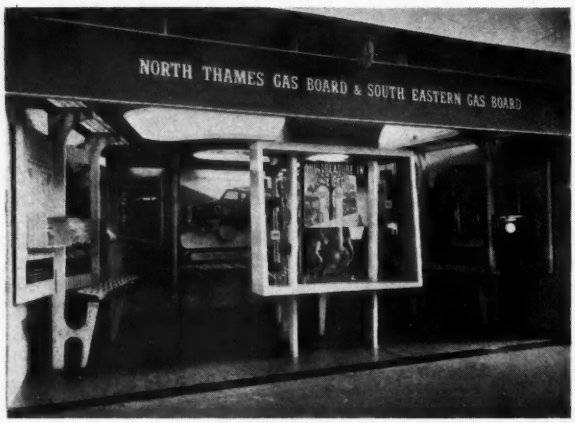
Mr. T. B. Scott (left) making the presentation to Mr. J. R. W. Alexander.

In making the presentation, the Secretary, Mr. T. B Scott, referred to the past four years as being the most vital in the long history of the gas industry. In acknowledging the tribute, Mr. Alexander said that the clock would constantly remind him of their happy association and achievements at Gas Industry House, to which he came 20 years ago.

GAS BOARDS' JOINT DISPLAY

The North Thames Gas Board and the South Eastern Gas Board co-operated this year in one stand at the British Industries Fair, Olympia, where the emphasis is on the by-products obtained by the carbonisation of coal, and their various uses.

The stand has a central display, 'Treasure in Coal,' illustrating pictorially the story of coal from the vegetation of pre-historic time to the coal mine of the present day. Behind this, numerous samples of by-products are displayed in small glass bottles, each very adequately labelled.



The first joint display arranged by two neighbouring Gas Boards.

A 6 ft. wooden cut-out model of a modern car, with guide strings, indicating the use of each by-product (either in the construction or running of the car) is the main subject and is used as a background. Enlarged photographs on either side of the stand display the uses of various by-products; one side shows how fertilisers and insecticides help food production. It also features part of a tar distillation plant and a tar surfaced road. The opposite side shows some of the medicinals; the plant for producing M. and B. 693, and a moulding machine which turns out plastic radio cabinets.

The whole stand was designed by the Display Section of the North Thames Gas Board.

GAS STOCK ISSUE

The Treasury announced on May 6 that the Gas Council had issued to the National Debt Commissioners under Treasury guarantee £40 mill. of British Gas 3% Guaranteed stock, 1990-1995, at a price of £100 10s. per £100 stock, as against par for the original compensation issue.

The Gas Council proposed this issue for the purpose of repaying temporary borrowing and of defraying capital expenditure chargeable to capital account, incurred by any area Board or the Council, and for the provision of working capital required by the area Boards and by the Council These proposals have been approved.

British Gas stock, which had reached 101⅛ during the week, was at once marked down on the Stock Exchange, and the price closed ¼ lower on the day at 100⅞, the same price as that at which the stock began on May 2. It was pointed out in financial circles that the additional issue would tend to spoil the market of those holders of approximately two-thirds of the capital of the gas industry, or some £140,000,000, whose stock has still to be valued, and who have not yet had a chance of realising the compensation price.

S.B.G.I. MEDAL AWARDS

The Council of the Society of British Gas Industries have again this year awarded Silver Medals to the Junior Gas Associations for the best paper adjudged to have been presented during the year by their members at a general meeting.

Twenty-one papers were submitted by nine Junior Gas Associations for adjudication. The following is a list of the awards:

London & Southern Junior Gas Association: J. A. Williams, of the Gas Light & Coke Company for paper 'Laying a Gas Main in the Sea.'

Yorkshire Junior Gas Association: J. R. Martindale, of the Sheffield and District Gas Company, for paper 'Dry Purification and Proposed Installation of Tower Purifiers.'

Midland Junior Gas Association: D. J. O. Bath, of the Bilston Gas Light & Coke Company for paper 'Supply and Demand.'

Wales & Monmouth Junior Gas Association: W. H. B. Ingram, of the Newport (Mon.) Gas Company, for paper 'Electricity on the Gasworks.'

Northern Junior Gas Association: W. R. Garrett, of the Newcastle & Gateshead Gas Company, for paper 'Foundations.'

Manchester District Junior Gas Association: H. Partington, of the Rochdale Gas Department, for paper 'Central Heating.'

Western Junior Gas Association: W. H. Tarn, of the Cheltenham and District Gas Company, for paper 'Some Aspects of Industrial Gas.'

Scottish Junior Gas Association (Western District): W. A. Green, of the Paisley Gas Department, for paper 'Distribution Organisation.'

Our photograph was taken on the occasion of the launching of the m.v. Murdoch on April 11 at Aberdeen. Left to right: Mrs. W. K. Hutchison, Sir Wilfred Ayre (Chairman and Managing Director, Burntisland Shipbuilding Company), Miss Hutchison and Mr. W. K. Hutchison, Chairman, South Eastern Gas Board.